AN EVENT RELATED POTENTIAL STUDY OF THE ROLE OF RELIGIOUS COMMITMENT IN THE NEURAL PROCESSING OF MORAL JUDGMENTS

A DISSERTATION

SUBMITTED TO THE GRADUATE SCHOOL

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE

DOCTOR OF PHILOSOPHY

BY

AARON M. ESCHE

DISSERTATION ADVISOR: DR. KRISTIN M. PERRONE-MCGOVERN

BALL STATE UNIVERSITY

MUNCIE, INDIANA

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Abstract

The purpose of this study was to examine how religious commitment impacts the neural processing of morally laden information. Event-related potentials were recorded while 35 participants, scoring either high or low on the Religious Commitment Inventory-10, read scenarios describing a social interaction with one of three endings: moral violations, conventional violations, or neutral acts. Participants judged all scenarios as either "OK" or "Not OK." Right brain hemisphere amplitudes were significantly larger than the left hemisphere for participants with high religious commitment. This finding suggests those with high religious commitment may process morally laden stimuli less abstractly and more veridically than those with low religious commitment.

An Event-Related Potential Examination of Neural Processing of Moral Judgments

Our senses of right and wrong pervade our existence (Kohlberg 1981), are shaped by our culture (e.g., religious commitment; Worthington et al., 2003) throughout development (Moll et al., 2005), and can serve both devastating and salutary roles in overcoming psychological trauma (Litz et al., 2009). However, little is written, as yet, to explain how neural functioning during the generative processes of moral reasoning may lead to greater understanding of how culture helps to form judgments and overall senses of right and wrong. This study is a necessary first step in elucidating the relationship between a specific aspect of culture and moral reasoning at the neural level.

As counseling psychologists, understanding how our clients think and reason is tantamount to understanding our clients as meaning makers. Kohlberg (1969) stated the cognitive processes involved in thinking and reasoning are in essence, a relating of events where knowledge and information from the world are integrated. Importantly, this reasoning encompasses the complete range of situations requiring thinking, judgment, and reasoning, from mundane decisions to complex dilemmas that may result in inevitable harm to oneself or to another. Kegen (1982) elaborated this point, stating that in order to understand our clients, reasoning must be viewed as an active relating and experiencing of the world rather than merely what the client knows. He stated: "to understand a client is to enter into that region between an event and a reaction to it—the place where it actually becomes an event for that person" (Kegen, p. 2). Hayes (1994) augmented this point, stating that when reasoning occurs, it is in fact our clients experiencing, understanding, and making meaning of the world. Hayes stated, "it is in this zone of mediation that counselors help clients to make better meaning of their

experience" (p. 262). Indeed, clients will face countless judgments in their everyday experience (Moll et al., 2005), including salient reasoning and judgment situations in the counseling room, such as examining personal motives, deciding what one should or would do, and contemplating hypothesized outcomes of acts that may affect others (Hayes, 1994).

However, reasoning and judgment are multifaceted enterprises that are not constrained to one domain (Turiel, 1983). They possess a relationship with contextual factors (e.g., religious commitment) that, as yet, is not understood comprehensively (Baumsteiger, Chenneville, & McGuire, 2014) and involve distinct brain areas and systems (Moll et al., 2005). These brain areas and systems operate largely outside of our conscious awareness (Greene et al., 2001; Moll et al., 2005), and, consequently, our understanding of them may be limited using traditional research techniques and paradigms. For instance, Decety and Cacioppo (2012) found that many of the neural systems involved in processing morally laden information were activated prior to the activation of areas associated with conscious awareness. Survey research and self-report measures are most commonly used in the body of judgment and moral reasoning research, but these explicit techniques are susceptible to a number of validity threats including demand characteristics and social desirability bias (Heppner, Wampold, & Kivlighan, 2008). Moreover, attitudes that may influence judgments and reasoning, such as discrimination or bias, often lie outside of respondents' awareness and may remain undetected using only explicit measures (Greenwald, McGhee, & Schwartz, 1998).

The direct study of the brain could provide a solution to these methodological concerns. Integration of neuroscience into these paradigms may prove indispensible in

deepening our understanding of the mechanisms and contextual influences underlying reasoning that occur both within and beyond conscious awareness. As noted by Goncalves and Perrone-McGovern (2014), our understanding of the neurobiological basis of behavior, cognition, and psychological processes has undergone a radical transformation in recent years with advances in the field of neuroscience (e.g., methodological advances in neuroimaging, neurophysiological methods, and neuromodulation techniques). Goncalves and Perrone-McGovern delineated the benefits of integrating neuroscience into traditional counseling psychology research paradigms, and proposed a developmental conceptual model for understanding the effects of environmental factors on neural processes. They proposed that brain networks are influenced by psychological factors such as social cognition, that are in turn influenced by interpersonal and environmental factors, which could include exposure to moral dilemmas and participation in or commitment to an organized religion.

Morality and Moral Reasoning

The attempt to define what constitutes moral behavior is a perennial philosophical issue concerning the very nature of what is good. As humans, we have historically glorified our ability to reason, holding virtuous our ability to conquer our emotions and passions through logic and mental discipline (Haidt, 2013). Kohlberg (1976, 1981) embodied this reverence for rationalism in his foundational model of moral reasoning; however, emerging research belies established conceptualizations of human moral functioning (Haidt, 2013; Moll et al., 2005). Rather than reason alone, evidence now exists that our moral judgments occur as an interaction of multiple influences and processes such as motive and emotional states (Greene et al., 2001; Haidt, 2001; Moll et

al., 2005). The moral neuroscience literature has burgeoned with the utilization of brain imaging and neurorecording technologies such as electroencephalography (EEG) and functional magnetic resonance imaging (fMRI). This has facilitated increased understanding of the neural processes involved in moral functioning. Moreover, the use of event related potential (ERP) methods has promoted understanding into the various inputs along the rapid time course of moral functioning (Yoder & Decety, 2014). If counseling psychologists are to truly understand how clients experience the world through their thinking, judgment, and reasoning, it will require an understanding of these underlying brain systems as well as the dynamics between the neural systems that shape clients' experience and perception of the world. Further, it will require an understanding of how contextual and environmental factors (e.g., religious commitment) may affect these brain systems and ultimately shape our clients' experiences.

Historically, religion has been seen as inextricably linked to morality; however, recent studies have revealed a complex and often indirect relationship between morality and religiosity (Baumsteiger, Chennevile, & McGuire, 2014). Religious values and morality both tap into individuals' most deeply held beliefs and attitudes about the world, guiding thought and influencing action. Within a counseling environment, both religion and morality are of paramount importance as they are pivotal in informing the nature of a disorder, the aims for therapy, and the course of treatment (Benish et al., 2011; Worthington, 1988). Benish and colleagues explained that beliefs about the nature of disorder and the course and treatment are formed through *illness myths*, which are culturally shaped experiences of distress. For example, one culture may tend to attribute mental illness to personal weakness, whereas another may attribute it to genetic,

biological, social, or environmental factors. Moreover, therapist and client agreement regarding the nature of a disorder, its course, and treatment conduces to more positive treatment outcomes (Benish, Quintana, & Wampold, 2011; Worthington, 1988). However, little research exists examining the neural correlates of morality and religious commitment, specifically with ERP methods allowing for the high temporal resolution necessary to examine the rapid sequential activation of neural areas in the time course of moral processing. This would be valuable to counseling psychologists, as understanding the relationship between morality and religion—and their influence on the process of reasoning and judgment during moral functioning—could provide an objective layer of understanding into the mechanisms that underpin how information from the world is internalized and construed into meaning for clients.

Moving from Rationalism

With increased sophistication of neuroscience technologies over the previous two decades, researchers have begun to examine how the brain processes morally laden stimuli (Greene et al., 2001; Moll et al. 2005). This novel source of information has led to a paradigm shift in our understanding of the processes of moral decision-making (Haidt, 2013). The regnant model of moral decision making for much of the late previous century was the Kohlberg (1981) rationalist model of moral development. Kohlberg (1976) developed an interviewing method, which he used with both adults and children to examine how they resolved hypothetical moral dilemmas. Kohlberg (1981) found that individuals' development of moral reasoning occurs in increasing rational sophistication over six total stages, with the progression through these stages predicated on how an individual reasons about the nature of justice and fairness.

Kohlberg's model was not without criticism. For example, Turiel (1983) expounded on differences between social conventions (i.e., rules that are culturally dependent, change across social groups, and serve to facilitate social coordination) and morals (i.e., universally held rules that transcend social and political authorities). Further, Turiel demonstrated that children were capable of distinguishing the difference between violations of morality and violations of social conventions as early as preschool, much earlier than Kohlberg (1981) postulated. Moreover, Smetana (2006) demonstrated this capability emerges in individuals as early as 39 months old.

Other competing theoretical models were proposed in the latter part of the last century, which began subtly parsing the human moral experience into dissociable components. For example, Rest (1986) dissected moral reasoning into four components: (1) moral awareness, which centers on a sensitivity to moral information; (2) moral judgment, which is the act of assessing rightness or wrongness of an action; (3) moral motivation, which centers on the degree of likelihood for acting on a moral judgment, and (4) moral character, which is the ability to commit to and carry out a line of action despite pressures or adversity. Jones (1991) elaborated on the Rest model, adding the component of moral intensity, which accounts for how a morally laden situation or dilemma itself may have varying degrees of impact on an individual's moral reasoning.

While these models offered an expanded view of moral functioning, they were consistent with Kohlberg (1981), in postulating moral judgment occurs only within the cognitive domain. In fact, Kohlberg, Levine, and Hewer (1983) contended that no single behavior has any particular moral standing unless it is driven by an explicit and deliberate moral judgment. This emphasis on cognitive processes during moral judgment drew

criticism (Haidt, 2013; Wilson, 1993), as Kohlberg's model was thought to myopically constrain moral functioning to reason alone. As will be explained in ensuing sections, a paradigm shift occurred in the literature, as other influences and processes (e.g., emotional processes, evolutionarily adapted sensitivities) were found to be involved in human moral functioning (Moll et al., 2005). As the body of research on human moral reasoning grew, several other empirically grounded theories of moral function arose (Cushman et al., 2006; Greene et al., 2001; Haidt, 2001; Moll et al., 2005; Waldmann & Dietrich, 2007), each espousing the notion that moral judgment occurs when a transgression or moral violation triggers a specific moral computation. For example, Greene et al. (2001) discovered brain areas associated with emotional processing are activated during moral reasoning tasks and are likely included in the moral reasoning calculus. He described a dual process model in which moral violations activate automatic emotional processes that influence or even compete with controlled cognitive processes in arriving at a moral judgment. Haidt (2001) invoked social influence as well as affective processes with his social intuitionist model. Similar to the dual process model, Haidt's model stated that moral violations trigger an automatic, pre-cognitive intuition, which is followed by ex post facto reasoning. Haidt stated these intuitions occur rapidly and without conscious deliberation, even possessing an affective valence about the situation. Moreover, he stated reasoning only occurs in the face of social pressures calling for one to explain the intuition. In other words, a judgment arises automatically and rapidly, and reasoning occurs more slowly and only when faced with social pressures calling for justification. Put simply, evidence has been emerging that there is more to moral judgment than conscious cognitive reasoning alone.

Toward a Neural Model of Human Morality

Moll et al. (2005) tied the Green et al. (2001) model with the extant brain lesion, cognitive neuroscience, and moral psychology literature to construct a model of human moral cognition. This model incorporated all brain areas implicated across this literature and circumvented their individual deficits in explaining moral behavioral phenomenon. The Moll et al. model is comprised of three main components that are thought to interact and bind moral coloring to our conscious experience:

1. Structured event complexes which are context-dependent representations of events and event sequences in the prefrontal cortex (PFC);
2. Social and functional features which is context-independent knowledge (i.e., semantic and featural knowledge) implicating the anterior and posterior temporal cortex; and
3. Central motive and emotional states, which entail the context independent activation of motivational and emotional states in limbic/paralimbic structures.

According to Moll et al. (2005), structured event knowledge is stored in different subdivisions of the PFC depending on the type of event knowledge, with novel and more difficult multitasking events associated with more anterior areas of the PFC (e.g., long-term goals and multi-stage events like making plans and thinking about the future). Social and emotional event knowledge are associated with ventromedial PFC areas which are fundamental in formation of attitudes and social stereotypes, and overlearned sequences (e.g., tying one's shoes or zipping a coat) are associated with medial and posterior PFC areas. Social perceptual and functional feature knowledge pertains to extracting social

information (i.e., social perceptions, like facial expression, prosody of speech, gaze, body posture, and gestures) as well as functional features of the environment. These specific areas serve as a sort of *social decoding* mechanism, as navigating our everyday social worlds requires the processing of vast amounts of information in the form of countless moral appraisals. Information from the world is extracted and processed by these brain areas, giving rise to the moral appraisals necessary for navigating social situations, "social functional features code for context-independent semantic properties that are extracted from different social situations" (Moll et al., 2005, p. 805). Finally, central motive states (e.g., aggression, guilt, shame, etc.), serve to provide emotional coloring as a basic mechanism for motivation. Researchers have found these motive and emotional states are consistently associated with limbic and paralimbic areas (e.g., Decety & Howard, 2013; Greene et al., 2001). The emotions elicited from these areas also serve important social navigational functions. For instance, guilt may arise when someone perceives failure to uphold a societal standard, whereas pride may be experienced when a societal standard is perceived to be upheld.

It is important to note the Moll et al. (2005) model of human moral cognition allows for the integration of culture with moral reasoning. It follows that religion, a salient cultural input (Worthington, 1988), would dovetail into the model in at least two possible ways. First, it would inform the type of context-dependent structural event-knowledge stored in prefrontal areas. As Moll stated, "the PFC has a central role in the internalization of moral values and norms through the integration of cultural and contextual information during development" (Moll et al., 2005, p. 804). Second, it would

inform the context-independent semantic knowledge housed in the pSTS during the extraction of social functional information in different social situations.

Goncalves and Perrone-McGovern (2014) described a model possessing some functional overlap with the Moll et al. (2005) model. For instance, the ventromedial prefrontal cortex (vmPFC) and temporal parietal junction (also reported in the literature as the posterior superior temporal sulcus (pSTS) [Decety & Caccioppo, 2012]) are areas implicated as a component of the Default Mode Network.

> "the social cognition network is a Default Mode Network connecting the mechanisms involved in spontaneous rest activity between the temporal parietal junction, posterior cingulate cortex, and ventral medial prefrontal cortex, areas of the brain that are associated with self-representation and theory of mind processes. Disruption of these networks has symptomatic expressions such as social inadequacy, attachment deficits, or lack of empathy" (Goncalves & Perrone-McGovern, 2014; p. 509).

Though not specifically a moral reasoning model, attachment deficits and lack of empathy are distinguishing characteristics of deficient moral functioning (Decety & Howard, 2013). Moreover, this functional overlap speaks to affective and cognitive inputs that may be necessary to moral reasoning (Decety & Cacioppo, 2012; Greene et al., 2001). Furthering this point, Decety and Cacioppo cautioned against considering the function of these brain areas as unique to moral reasoning, stating, "moral reasoning seems to be underpinned by specific neural circuitry, but, in fact, these circuits…involve regions and systems underlying specific affective states and cognitive and motivational processes" (p. 3068).

The Virtue of Event-Related Potentials

The identification of the underlying brain areas was an essential first step in understanding the cognitive neuroscience of human moral functioning. This first step was also important for counseling psychologists because it offers at the very least a biophysical marker for specific deficits in healthy personal and interpersonal functioning. Moreover, with these underlying components identified, an examination of the temporal dynamics (i.e., how these areas activate in sequence over time when processing morally laden information) became possible. Neuroimaging techniques such as fMRI were crucial in identifying the neural areas of human moral cognition; however, their utility is limited in that these techniques have very low temporal resolution and may fail to capture all of the activations—and sequences of activations—of neural areas and systems in the rapid time course of moral reasoning (Yoder & Decety, 2014). As such, it may be of limited utility in examining how the components of the Moll et al. (2005) model activate in sequence to produce moral functioning. Indeed, the prefrontal areas implicated in the aforementioned moral reasoning models are activated very rapidly post stimulus onset. During moral reasoning tasks, Decety and Cacioppo (2012) found the vmPFC was activated between 182-304 ms post stimulus, and Lahat, Helwig, and Zelazo (2013) found general activation of prefrontal areas between 200-500ms post stimulus. Considering this limitation, electroencephalographic (EEG) techniques, specifically those examining event-related potentials (ERPs) may be uniquely suited to examine moral reasoning's rapid time course, as the temporal resolution of these techniques can be at the 1 ms level (Yoder, & Decety, 2014).

What is ERP? Having made the case for ERP's utility in investigating the time course of human moral functioning, a discussion about the nature of ERP is warranted. Brain ERPs are a detection of the electric field generated on the scalp by the movement of ions within neural mass in fixed temporal relation to the arrival of information or movement (Brandeis & Lehmann, 1986). ERPs must be distinguished from evoked potentials, which reflect sensory processing; ERPs evaluate neural activity in response to a certain event (Hruby & Marsalek, 2003). Further, ERP research is predicated on the premise that psychological processes leading to the completion of a certain task require changes in content of thought and attention, and these are evident in changes of electrical activity that neural systems generate (Hruby & Marsalek, 2003).

ERPs are measured with the use of electroencephalography (EEG), which entails placing a number of electrodes in specific places about the scalp using a conductive gel (Landa et al., 2014). The EEG data is examined before, during, or after stimulus onset, and potential differences between pairs of electrodes (with one electrode recording) are sampled several hundred times per second (Brandeis & Lehmann, 1986). Electric scalp fields vary over time in both strength and location, providing a topography of electrical activity, and offering spatial and temporal information about processing in relation to time-locked stimuli (Brandeis & Lehmann, 1986). Time-locked stimuli are important to ERP research because ERPs are reported as an average of multiple EEG readings from repeated exposures to the same stimulus (Landa et al., 2014).

The N2 component. Time windows of ERPs are subdivided into components. Peaks and troughs of the waveforms are traditionally thought of as components that reflect maximal activation of brain processes in response to the stimulus (Brandeis &

Lehmann, 1986). Past researchers have established that the N2 component is a negative-going wave that peaks between 200 and 350 ms post stimulus onset and is an index of cognitive conflict detection (Folstein & Van Petten, 2008). Cognitive conflict occurs when multiple competing actions are contemplated with only one of these actions being the appropriate course of action that is selected (Cohen, 2014). The N2 is usually generated at medial-frontal sites and is larger when conflict is high (Azizian, Freitas, Parvaz, & Squires, 2006; Botvinick, Braver, Barch, Carter, & Cohen, 2001). Cognitive conflict, as detected by N2 activation, has been commonly studied with the use of go/no-go tasks that entail a tendency to make prepotent but incorrect responses (Donkers & van Boxtel, 2004; Nieuwenhuis et al., 2003). However, the N2 is not elicited specifically to go/no-go tasks. Botvinick et al. reviewed the literature on N2 as an index of cognitive conflict monitoring with studies using response competition, adjustments in perceptual selection, and maintenance of contextual information. Lahat, Zelwig, and Zelazo (2013) also observed N2 activation in both children and young adults during tasks that involved judging morally laden scenarios. Source localization analyses have implicated ventral PFC areas (e.g., orbitofrontal cortex) and dorsomedial PFC areas (e.g., dorsal anterior cingulate cortex [ACC]) during N2 activation (Bokura, Yamaguchi, & Kobayashi, 2001; Nieuwenhuis et al., 2003).

It should be expected, then, that N2 components would be observed over frontal brain areas during moral reasoning tasks, as these tasks likely require participants to weigh potentially competing information. That is, moral reasoning tasks may require the consideration of social contexts as well as the interests of more than one party that are potentially conflicting. Moreover, it should be expected that with higher cognitive

conflict (e.g., the greater the number and profundity of considerations), higher N2 amplitudes would be observed.

Brain hemisphere asymmetries. An important aspect in examining how the brain processes information involves an understanding of the different ways each hemisphere processes stimuli. Accordingly, ERP research commonly entails lateralization analysis, comparing waveforms across hemispheres (Luck, 2005). Previous studies suggested factors such as emotion and valence (Heller, 1993; Zhang, Zhou, & Oei, 2011), or specific characteristics about presented stimuli (Evans & Federmeier, 2007) were associated with differential processing across brain hemispheres. Evidence of brain processing asymmetries for specific tasks arose as early as the mid 1800s with Broca's groundbreaking work on the localization of language production (Joynt, 1966). Broca identified a specific area of the brain (i.e., Broca's Area) after examining two patients who had both lost their ability to speak. Both patients had suffered insult to the same neural area in the left hemisphere. Neural processing asymmetries are common in the literature (Hellige, 1993), and among the most germane to the current study are those produced during visual perception and language neurocognitive tasks.

Neuroscience research on visual perception asymmetries first emerged over 50 years ago, as Kimura (1966) discovered the left and right hemispheres produce differential processing of visual information. Kimura presented participants with random successions of letters or non-alphabetical stimuli to either the right or left visual fields. Kimura found that participants were able to more accurately identify letters when presented in the right visual field, whereas the non-alphabetical stimuli were more accurately identified when presented in the participants' left visual fields. These findings

suggested the left hemisphere functioned to identify verbal-conceptual forms while the right hemisphere served to register nonverbal stimuli. Put simply, these findings suggested both hemispheres are involved in the processing and remembering of visually presented stimuli, but that the hemispheres cull different kinds of information from the same stimuli.

More recently, Evans and Federmeier (2007) utilized ERP methodology to examine the time course of hemispheric asymmetries during a verbal memory task. In their task, Evans and Federmeier presented participants with 567 nouns, each with a length of 4-6 letters that were selected for their frequency of use in the English language. These words were randomly presented in a serial fashion on either the right or left side of a computer screen, and a random selection of these words were repeated at random intervals during the task. The participants were asked to (a) fix their gaze on a cross in the center of the screen while the words were presented, then (b) respond "yes" if the word being presented had been displayed previously or "no" if it was the first presentation of the word. Evans and Federmeier found that stimuli processed in the right hemisphere (i.e., presented in the left visual field) were more accurately identified during the task overall, but that P2 component potentials (an index of implicit memory processing) were greater in left hemisphere. This suggested the left hemisphere processed visually presented verbal stimuli with more abstract processes while the right hemisphere was involved in more veridical processing.

Religion and Differential Neural Processing

Considering the potential influence of social contexts on moral reasoning, a discussion of how specific cultural inputs may affect neural processing is warranted. Moll

et al. (2005) called for an examination of how culturally shaped values and preferences may influence social interactions. Religion is one such cultural input (Baumsteiger, Chenneville, & McGuire, 2014). Moreover, religion has been associated with differential neural processing (Inzlicht, McGregor, Hirsh & Nash, 2009). Inzlicht and colleagues found evidence suggesting religion may produce an emotionally palliative effect. These authors utilized EEG and compared ERP data of participants with varying levels of religious zeal as they completed the Stroop color-naming task (MacLeod, 1991), a task designed to be mentally difficult. It was found that higher levels of religious zeal were related to lower error-related neural responses. Further, source localization of this ERP data coincided with the N2 cognitive conflict detection literature, as these findings were a product of differential activation of the anterior cingulate cortex (ACC).

Having established religion's association with differential neural processing, a basis is provided to search for other possible ways that religion may affect neural processing. Given the inconsistent findings in the literature relating morality to religion (Baumsteiger, Chenneville, & McGuire, 2014), neuroscience techniques, specifically ERP, may be well-suited to provide another layer of insight, as it provides objective, high-temporal-resolution accounts of neural processing.

Purpose and Importance of the Study

In the present study, I examined how the brain processes morally laden stimuli and the role of religion in influencing neural response. Specifically, I examined the effect of religious commitment and the type of dilemma (conventional or moral) on the amount of neural resources needed to make a judgment about the dilemma. By examining the role of religious commitment and type of dilemma presented to participants, I hoped to

answer the call to action put forth by Gonçalves and Perrone-Mcgovern (2014) and to provide a foundational understating of the neural mechanisms underlying reasoning. Understanding this relationship is a crucial initial step toward understanding the processes involved in the zone of mediation where we—and our clients—make meaning of our experience.

Hypotheses

H1: It was hypothesized that differences would be found in N2 amplitude as measured by ERP based on religious commitment and type of dilemma, such that participants in the religiously committed group would have lower N2 mean amplitudes for dilemmas depicting social conventional violations than participants in the non-religiously committed group, and no group differences based on religious commitment were predicted in mean N2 amplitude for dilemmas describing moral violations.

Rationale: Based on Turiel's (1983) theory, I expected N2 amplitudes would be lower for religiously committed individuals than for non religiously committed individuals for social conventional dilemmas and I did not expect group differences based on religious commitment for moral dilemmas. Turiel (1983) described social conventions as being bound by specific cultures, but argued that moral considerations are universal and independent of culture, centering on fairness and prevention of harm. Thus, I expected to see differential processing during judgments of scenarios describing social conventional but not moral violations. Combining Turiel's theory with the Moll et al. 2005 theory, which states that values and norms are internalized by integrating cultural information into the prefrontal cortex, differential

processing was expected between participants who are religiously committed and those who are not for social conventional dilemmas. Differences based on religious commitment for social dilemmas were expected because religiously committed individuals tend to have a readily available schema for judging events as good or bad (Worthington et al., 2003). Conversely, those who are not religiously committed may lack a readily available schema and draw from a wider range of contextual information in considering the circumstance of the scenario. Thus, more attentional and neurocognitive resources would be required, resulting in higher mean N2 amplitudes.

H2: It was hypothesized that differences would be found in N2 amplitude as measured by ERP based on the type of dilemma presented to participants (moral or conventional), such that when presented with a moral dilemma, participants would have lower N2 mean amplitude than when presented with a conventional dilemma.

Rationale: Based on Turiel's (1983; 2008) theory, moral violations are unalterable and consistently judged as bad across cultures and contexts. Conversely, social conventional violations can be changed based on social consensus or by authority. Taken together, I expected social conventional violations to require greater neurocognitive resources and consequently produce higher N2 amplitudes compared to moral violations, as providing judgments about them would require drawing from a wider range of contextual information.

Methods

Participants

There were 47 students who completed the study. However, 12 participants were removed from the final analysis because (a) their data were not recorded due to technical difficulties (n = 6) or (b) their EEG contained artifacts (e.g., muscle movement, electrical interference, or perspiration) that rendered the EEG unusable (n = 6). Participants included in the final analysis were 35 students (27 female, 8 male) from a large Midwestern university who were at least 18 years of age (M_{age} = 21.64 years, SD = 2.047, *range* = 19-29). Participants were grouped based on their scores on a measure of religious commitment, with 19 scoring high in religious commitment, and 16 scoring low in religious commitment (see below). Participants reported their ethnicities as follows: 94% Caucasian, and 6% African-American. Of those participants who provided a religious affiliation 36% identified as Roman Catholic, 36% identified as Protestant Christian, 12% identified as agnostic, 12% identified as non-denominational Christian, and 4% identified as Other (e.g., "a blend of many to form my own and higher power mastery orientation").

Procedure

Prior to data collection, approval was obtained by Ball State University's Institutional Review Board (IRB). Recruitment began by first requesting permission to use the Counseling Psychology Department (CPSY) subject pool and a campus-wide email bulletin service. Following IRB approval, recruitment emails were sent to course instructors in the CPSY department and a recruitment bulletin was placed in the campus-wide service. The CPSY instructors then forwarded the recruitment emails to their students. Additionally, approval was also granted by the IRB to recruit from a local Catholic church's ministry for college students. A recruitment email was sent to the

leader of the church group who then forwarded the recruitment email to the members of the group. All recruitment emails indicated the purpose of the study was to examine patterns of brain activity during reasoning tasks. Interested participants were instructed to contact the researcher in order to schedule a 2-hour time slot in the lab, which allowed sufficient time for completion of informed consent, a demographic questionnaire, a measure of religious commitment, and completion of a moral judgment task while having EEG and ERP data recorded. Participants who took part in the study through the CPSY pool (*n*=32) received two hours of research credit as partial fulfillment of course requirements for their courses in the CPSY Department. Participants recruited from the Catholic church (*n*=3) received a one-time stipend of $20 for taking part in the study.

The informed consent document notified the participants of the voluntary nature of the study and of their right to withdraw from the study at any time. Participants indicated they read and understood the information within the informed consent document before being allowed to participate in the study. Following the demographics questionnaire, participants completed a measure of religious commitment. The participants were then instructed to sit comfortably while the EEG cap and electrodes were placed in preparation for the EEG recording. After electrode placement the participants completed a computerized moral reasoning task (the task is described in a subsequent section) while EEG was recorded. After completing the task, participants were presented with a debriefing form, which included information about the study as well as contact information for the primary investigator and faculty advisor.

Design

Participants were separated into groups based on their scores on a measure of religious commitment, the Religious Commitment Inventory-10 (RCI-10; Worthington et al., 2003). Worthington et al. determined the normative mean RCI-10 score for U.S. adults to be 26. Further, they categorized individuals with RCI-10 scores of 38 and higher as highly religiously committed. Consistent with these findings, participants in the current study were considered not religiously committed if they obtained scores between 10 and 26 (i.e., they scored equal to or less than the mean RCI-10 score from the overall norming sample obtained in Worthington et al.), and highly religiously committed if they obtained scores of 38 and higher. Thus, in the present study, individuals who produced RCI-10 scores between 27 and 37 were not included because these scores were within one standard deviation from the mean from overall U.S. sample obtained by Worthington et al. Participants' responses to dilemmas were separated into groups based on the type of dilemma (i.e., moral, conventional, or neutral). These inclusion criteria were chosen because the mean RCI-10 scores obtained in the Worthington et al. (2003) norming samples from Christian churches, Christian agencies, and students at Christian private universities ranged from 37-39, while the overall mean from secular institutions (i.e., not explicitly religious) was 26. The amplitude of brain waves measured by ERP was compared across low and high religious commitment groups.

A way to operationalize morality. This study utilized a computerized moral reasoning task programmed by this researcher using E-Prime software (Psychology Software Tools, n.d.). following methodology developed by Lahat, Helwig, and Zelazo (2013). Participants viewed the paradigm on a computer monitor with 1920 x 180 resolution and a 60 hertz refresh rate. Participants provided their responses using a

Cedrus RB-530 response pad. The task included 18 blocks of 15 trials, in which a scenario describing a social interaction was presented (see Appendix H). Participants read an introduction (or stem) to each scenario and then pressed any button on a response box to indicate (a) they read and understood the introduction to the scenario and (b) that they were ready to be presented with the ending of the scenario. After pressing this button, a fixation cross was displayed, on which the participant was instructed to focus their attention. Having the participants focus on this cross minimizes motoric potentials (e.g., eye movements) that could perturb or overshadow the ERP. Further, the fixation cross was presented with randomized variable durations (i.e., 800, 1000, or 1200 ms) in order to reduce EEG effects caused by higher predictability of the target stimulus. Following the fixation cross, participants were shown an ending to each scenario that entailed either a (a) moral violation, (b) social conventional violation, or (c) neutral act. The scenario stems were presented in randomized order, and each type of ending was presented randomly, but each participant was presented the stems and endings an equal number of times. Participants were asked to press buttons on a response box indicating they judged the ending to the scenario as either "OK" or "Not OK." Participants were instructed to provide their responses as quickly as possible. Following the response, participants were shown feedback indicating their response was recorded or that no response was recorded. To ensure participates had adequate time to read this feedback, the feedback remained on the screen until participants pressed a button on the response pad.

Following procedures implemented by Lahat, Helwig, and Zelazo (2013), participants were to be excluded from the final analysis if they provided less than 24 normative responses in each condition (i.e., moral, conventional, and neutral) during the

moral reasoning task. Trial counts for nonnormative responses were less than 24 for all participants and, thus, no participants were excluded according to this criterion. Normative responses, according to Lahat and colleagues, included "Not OK" judgments for both moral and conventional violations and "OK" judgments for neutral scenarios.

Participants were familiarized with the equipment and the presentation of the scenarios in a series of two initial practice tasks. The first task entailed presenting the participant with a series of single words (e.g., friendship, murder, warmth, kill) to which the participant pressed a button on a response box indicating they deemed the word as either "OK" or "Not OK." These words were randomly selected and their only purpose was to orient the participant to providing judgments of presented stimuli. The second practice round modeled the main study and served to orient the participant to how stimuli were presented in the main study. For this second practice round, participants first were shown a scenario introducing a social interaction followed by an ending that was to be judged as either "OK" or "Not OK." The scenarios were unique to the practice section (i.e., not the scenarios utilized for the main study) and, to ensure understanding of the task, the participant was provided an opportunity to repeat the trial if the opportunity for input was missed.

Data Acquisition and Processing. The ERP data was collected using an elastic cap and an Active Two Biosemi Electric System (Biosemi, Amsterdam, the Netherlands). The EEG recording was conducted with 64-recording channels using silver-chloride electrodes with a BioSemi Active Two system (http://www.biosemi.com; BioSemi B.V., Amsterdam, Netherlands) configured to the 10-20 system. A sampling rate of 2048 hz was used during recording, followed by a down-sampling to 512 hz to ensure faster

processing. The electro-oculogram (EOG) was monitored with two electrodes, as well as two additional electrodes placed near the participants' right and left mastoid processes. Electrical impedances during data collection were kept below 10 kΩ and were acquired with an online reference unique to the Active Two system (BioSemi EEG, n.d.). Although reliability and validity data are not typically reported for psychophysiological apparati, Gaspar et al (2011) examined the test-retest reliability of single-trial ERPs to faces over a 5-day period. They were able to demonstrate that ERPs are reproducible within participants, who then are reliably differentiable from other participants in terms of their electrophysiological response.

Offline, the data underwent a bandpass filter to remove frequencies below.5 and above 55hz. Aberrant perspiration and non-stereotypical motor EEG artifacts were removed manually, and bad channels were removed from the EEG trial-wise. The continuous EEG was then segmented into 800ms time-locked epochs, beginning with 200 ms before stimulus onset and continuing until 600 ms post stimulus onset. Following segmentation, independent component analysis (ICA) was run using EEGLAB's runICA algorithm to remove eye blink and movement artifacts. ICA is a blind source separation technique that separates the multivariate signal into additive subcomponents, allowing for components of the signal (i.e., both artifactual and actual neural activity components) to be isolated and subtracted from the multivariate signal, if necessary (Delorne & Makeig, 2004). Bad channel interpolation was then conducted trial-wise, and ERPs were baseline corrected to 200 ms prior to stimulus onset.

Instruments

The Religious Commitment Inventory-10 (RCI-10). Religious commitment was assessed using the RCI-10 (Worthington et al., 2003), a ten-item measure assessing "the degree to which a person adheres to his or her religious values, beliefs, and practices, and uses them in daily living" (p. 85). The scale was developed and validated across six studies on three samples of college students *(n* = 155, 132, and 150 respectively), 240 Christian church-attending married adults, 468 undergraduates of differing religious backgrounds (i.e., Buddhist = 52, Muslim = 12, Hindus = 10), and 217 clients and 52 counselors from six different counseling agencies (both religious and secular). Participants are asked to report how well a statement describes them, with scores ranging from 1 (not at all true of me) to 5 (totally true of me). Further, the RCI-10 is a particularly relevant measure for this study, as the underlying assumption is that a religiously committed individual evaluates the world through religious schemas and integrates his or her religion into much of his or her life (Worthington et al., 2003). In other words, this assumption speaks to a possible mechanism for differential processing of information between those who are highly religiously committed and those who are not.

Worthington and colleagues (2003) reported the RCI-10 demonstrates reliability, with (a) Cronbach's alpha at .93, indicating adequate internal consistency; and (b) 3-week and 5-month test-retest reliability, with Pearson coefficients of .87 and .84 respectively. Cronbach's alpha for the present study was .96, demonstrating similarly adequate internal consistency. Worthington et al. (2003) found evidence for construct validity for the RCI-10 when conducting an analysis of variance (ANOVA), in which participants' RCI-10 scores were treated as the dependent variables, and participants' level of religiosity (i.e., participants' endorsement or denial of salvation on the Rokeach's Value Survey;

Rokeach, 1967) were treated as the independent variables. It was found that RCI-10 scores were significantly higher for those who endorsed a religious value as compared to those who denied a religious value. Divergent validity was demonstrated in Worthington et al. (2003) in two separate analyses. In the first analysis, Pearson correlation coefficients were used to examine the relationship between RCI-10 scores with an endorsement of a single-item measure of spirituality as an exemplary human characteristic (Koenig et al., 2001). The RCI-10 scores were not correlated with an endorsement of spirituality as an exemplary human characteristic, r (154) = .18. The second analysis examined the relationship of RCI-10 scores with scores on the Visions of Everyday Morality Scales (VEMS; Shelton and McAdams, 1990). No correlation was found between the scores on these scales, r (154) = .09, p = .26, ns. Criterion validity was demonstrated in Worthington et al. (2003) by examining the relationship between RCI-10 scores and frequency of attendance of religious activities. Frequency of attendance of religious activities was significantly correlated with scores on the RCI-10, r (154) = .70, p =.0001. In the current study, the scale was used to separate participants based on level of religious commitment.

Validity of the Scenarios. The scenarios that were used in this study were developed by Lahat, Helwig, and Zelazo (2013) to operationalize the constructs of moral and social conventional rule violations in a format consistent with ERP methodology. Lahat and colleagues utilized scenarios from previous research that was theoretically grounded in social domain theory (Turiel, 1983) to assess judgments regarding moral and social conventional violations (Nucci, 1981; Smetana, 1981; & Turiel, 1983). These previous studies, however, presented the scenarios in formats that are inappropriate for

ERP methodology. That is, ERP requires rapid, well-controlled target stimuli (Luck, 2005), and these previous studies presented the scenarios as either lengthy narratives or a series of pictures. Lahat adapted these scenarios such that (a) the target stimuli (i.e., the endings of the scenarios) were comprised of only one or two words and were matched across violation type for number of syllables, and (b) the introduction of each of the scenarios was constant across dilemma types.

Within the social domain theory literature, the concept of *rule contingency* is employed to assess whether the hypothetical scenarios demonstrate construct validity with respect to the domains they are intended to represent (Lahat et al., 2013; Nucci, 1981; Smetana, 1981; Turiel,1983). More specifically, rule contingency is utilized to provide evidence of social domain theory's construct validity by providing evidence for divergent validity between the moral and social conventional domains. Rule contingency requires participants to judge scenarios on two separate conditions, one in which participants are to assume there are societal rules in place prohibiting the acts described in the scenarios, and one in which participants are asked to provide judgments assuming these societal rules are removed. This is accomplished by presenting each of the scenarios to the participant and then asking the participant to provide a judgment about each scenario without providing any explicit information to the participant about the presence of societal rules. Following this condition, each participant is then instructed to provide their judgment to each scenario, but while imagining any societal rules prohibiting the violations in the scenarios are absent. As an example, a participant in the first condition may be asked to provide a judgment about an individual who lied to someone in order to

avoid punishment. In the second condition, the participant would be asked to provide the same judgment, but while imagining that societal rules prohibiting lying are absent.

Lahat and colleagues (2013) utilized the rule contingency framework to provide evidence for the validity of their scenarios. That is, each participant received both of the rule contingency conditions during a moral judgment task. Across both rule conditions, participants largely revealed that (a) moral violations were "not ok" (i.e., 98.01% when rule assumed, and 89.67% when rule not assumed), and (b) neutral acts (i.e., scenarios with no moral or social conventional violation) were "ok" (i.e., 89.5% when rule assumed, and 97.55% when rule not assumed). In contrast to moral violations and neutral acts, more variation was found in responses to conventional violations: when a rule was assumed 87.2% judged the action as "not ok," and when the rule was removed only 26.75% judged the action as "not ok" (Lahat, et al). In other words, moral violations and neutral acts were judged similarly regardless of whether a rule was in place, whereas judgments of social conventional violations depended largely on whether or not a rule prohibiting the act was in place.

These findings are consistent with social domain theory (Turiel, 1983), which states that moral considerations are universal, immutable across cultures, and center on prevention of harm and maintenance of fairness, and social conventional considerations are rule-based, change across cultures, and can be influenced by social consensus or authority figures. Further, participant responses to the scenarios in the study by Lahat, et al (2013) were consistent with the studies from which the scenarios were adapted (Nucci, 1981; Smetana, 1981), providing evidence of criterion validity for Lahat and colleagues' scenarios.

Nucci (1981) studied participants between 7 and 20 years of age and found that, across ages, (a) moral violations were construed as wrong even in the absence of a social rule prohibiting the acts, and (b) the majority of participants deemed conventional acts as acceptable in the absence of rules prohibiting the behaviors. These findings provided evidence for construct validity of social domain theory, as it demonstrated judgments of social conventional violations are alterable, whereas judgments of moral violations are fixed. Further, Nucci provided evidence for construct validity, as the participants were asked to complete an additional sorting task. This task asked participants to sort the depicted moral violations, social conventional violations, and scenarios involving personal business (i.e., "actions outside of societal regulation and moral concern" p. 114) as either "wrong" or "should be a person's business." All participants sorted the moral violations as wrong even in the absence of a rule. Conversely, very few of the participants sorted the social conventional violations as wrong in the absence of a rule.

Smetana (1981) found the same distinction between moral and social conventional violations, demonstrating additional divergent validity. Smetana presented 44 preschool children between the ages of 3 and 5 years with descriptions of conventional and moral transgressions. These children were asked to rate the level of seriousness of the violations in both the presence and absence of a rule prohibiting the acts. They were also asked whether these acts were acceptable in different contexts. Smetana found that moral transgressions were rated as more serious than conventional, providing evidence that a distinction between these domains emerges at an early age. The findings from this rating task provide evidence of convergent validity with Lahat, et al. (2013), as both the rating task in Smetana and the judgment tasks in Lahat, et al. demonstrated the same distinction

between moral and social conventional domains. Moreover, because the same distinction was found for Lahat and colleagues' adaptation of Smetana's scenarios, this provided additional evidence for criterion validity of the adapted scenarios.

Lahat et al. (2013) found evidence of discriminant validity for their adapted scenarios in their research using ERP methodology. Specifically, they found that mean N2 amplitudes for neutral scenarios were significantly lower than mean N2 amplitudes for both moral and conventional scenarios. This suggests a distinction between neutral acts and violations within the domains of social domain theory, in that both moral and social conventional violations were associated with higher cognitive conflict than scenarios entailing no violation. The N2 component is a negative-going wave that peaks between 200 and 350 ms post stimulus onset. The N2 is generated in the medial-frontal area and evidences greater amplitude for high compared to low cognitive conflict than for lower cognitive conflict (Azizian et al., 2006; Botvinick et al., 2001). More specifically, source localization analyses have identified ventral prefrontal cortex (PFC) areas (e.g., orbitofrontal cortex) and dorsomedial PFC areas (e.g., dorsal anterior cingulate cortex [ACC]) during N2 activation (Bokura, Yamaguchi, & Kobayashi, 2001; Nieuwenhuis et al., 2003). Further, these areas of the brain are associated with cognitive conflict detection (Folstein & Van Petten, 2008).

Cognitive conflict occurs when multiple competing actions are activated, with only one of these actions being the appropriate course of action (Cohen, 2014). As such, cognitive conflict would be appropriate in examining moral-conventional distinctions, as judging moral and conventional dilemmas entails the consideration of social contexts as well as the interests of more than one party that are potentially conflicting (Davidson,

Turiel, & Black 1983; Greene et al., 2001; Turiel, 1983). More specifically, cognitive conflict, as detected by N2 activation, has been commonly studied with the use of go/no-go tasks that entail a tendency to make prepotent but incorrect responses (Donkers & van Boxtel, 2004; Nieuwenhuis et al., 2003). However, the N2 is not elicited specifically to go/no-go tasks. Botvinick et al. reviewed the literature on N2 as an index of cognitive conflict monitoring and described studies using response competition, adjustments in perceptual selection, and maintenance of contextual information. Thus, evidence exists supporting the use of the N2 as a measure of conflict detection.

The research findings described above support theoretical assertions of Moll et al. (2005), who utilized extant brain lesion, cognitive neuroscience, and moral psychology literature to construct a model of human moral cognition. In the above paragraphs, evidence was provided for examining specific neural areas (i.e., PFC areas) when examining N2 as an index of cognitive conflict detection. These same areas coincide with the Moll et al. model, strengthening the case for observing N2 ERPs in these areas to investigate moral-conventional distinctions. The Moll et al. model is comprised of three components: Structured event complexes (context-dependent representations event sequences in the prefrontal cortex [PFC]); social and functional features which are context-independent (i.e., semantic and featural knowledge) implicating the anterior and posterior temporal cortex; and central motive and emotional states (context independent activation of motivational and emotional states in limbic/paralimbic structures). Thus, the same PFC areas are implicated between the Moll et al. model and the cognitive conflict detection literature. This convergence of evidence buttresses the use of N2 amplitude in examining moral-conventional distinctions during judgment tasks.

Data Analysis

A 2x3 mixed methods ANOVA was conducted to examine the between-subjects effects of religious commitment (non religiously committed vs. religiously committed) and within-subjects effects of type of dilemma (moral, conventional, or neutral) on the amplitude of brain waves as measured by ERP at N2, with level of religious commitment and dilemma type serving as independent variables and mean N2 amplitude serving as the dependent variable. ANOVA is considered the dominant statistical technique in ERP research, as the great majority of cognitive ERP research involves investigating main effects and interactions in fully cross-factorial designs (Luck, 2005). However, because each participant's mean N2 amplitude was measured for both moral and social conventional conditions (i.e., a within subjects factor), and each participant was only assigned one religious commitment condition based on their RCI-10 score (i.e., a between subjects factor) a mixed design ANOVA was appropriate. The 2x3 ANOVA was conducted using the Statistical Package for the Social Sciences (SPSS; Version 24).

I hypothesized first that differences would be found in N2 amplitude as measured by ERP based on religious commitment and type of dilemma, such that participants in the religiously committed group would have lower N2 mean amplitudes for dilemmas depicting social conventional violations than participants in the non-religiously committed group, and such that no group differences based on religious commitment were predicted in mean N2 amplitude for dilemmas describing moral violations. This hypothesis was tested using a 2x3 mixed methods ANOVA in order to examine the interaction (if any) between the type of dilemma and whether or not a participant is religiously committed. A significant interaction from this omnibus test would indicate the

effect of dilemma type on mean N2 amplitudes is different between those who are religiously committed and those who are not.

The second hypothesis stated that differences would be found in N2 amplitude as measured by ERP based on the type of dilemma presented to participants (moral or conventional), such that when presented with a moral dilemma, participants would have lower N2 mean amplitude than when presented with a conventional dilemma.
From the same ANOVA conducted for the first hypothesis, a main effect for dilemma type on N2 amplitude would be determined by examining the *F* test for within-subjects effects. A significant omnibus within-subjects *F* test would indicate a difference in the effect of moral dilemma type on N2 amplitude, and estimated marginal means were to be examined to determine which dilemma type is associated with higher or lower N2 amplitudes. Finally, because of the lack of independence inherent to within-subjects comparisons, covariances between groups may be a value different from zero, requiring the covariances to be assumed equal (i.e., the assumption of sphericity is met; Howell, 2013).

Results

ERP Data

Examination of scalp topographical plots of the grand-averaged data for all participants revealed arguable central N2 component at frontocentral electrode sites for both moral scenarios and well-formed N2 components for conventional scenarios, all between 250 ms and 350 ms post stimulus onset. Per Luck (2005), ERP data was averaged across a cluster of electrodes (C1, Cz, C2, CPz, FC1, FCz, FC2; See Figures 1 and 2 for analysis). Frontocentral electrodes were chosen as these electrodes overlie areas

implicated in moral reasoning (Moll et al., 2005) as well as cognitive conflict detection (Cohen, 2014). Data were analyzed using a mixed design 2 x 3 ANOVA with RCI-10 score (high, low) as a between subjects factor and dilemma type (moral, conventional, neutral) as a within-subjects factor. Mauchly's test indicated that the assumption of sphericity was not violated ($\chi^2(2) = 1.76$, $p < .416$). The ANOVA revealed a non-significant interaction, $F(2, 33) = 0.800$, $p = .454$, $\eta_p^2 = .024$. The main effect for dilemma

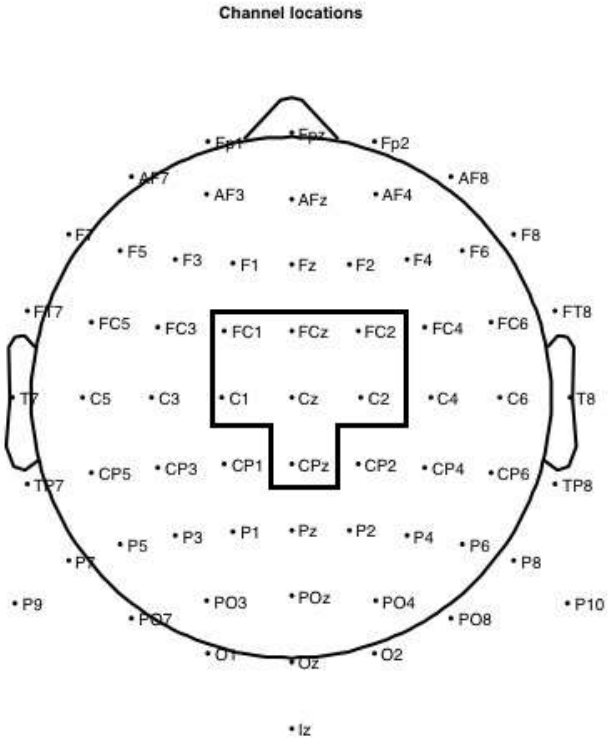
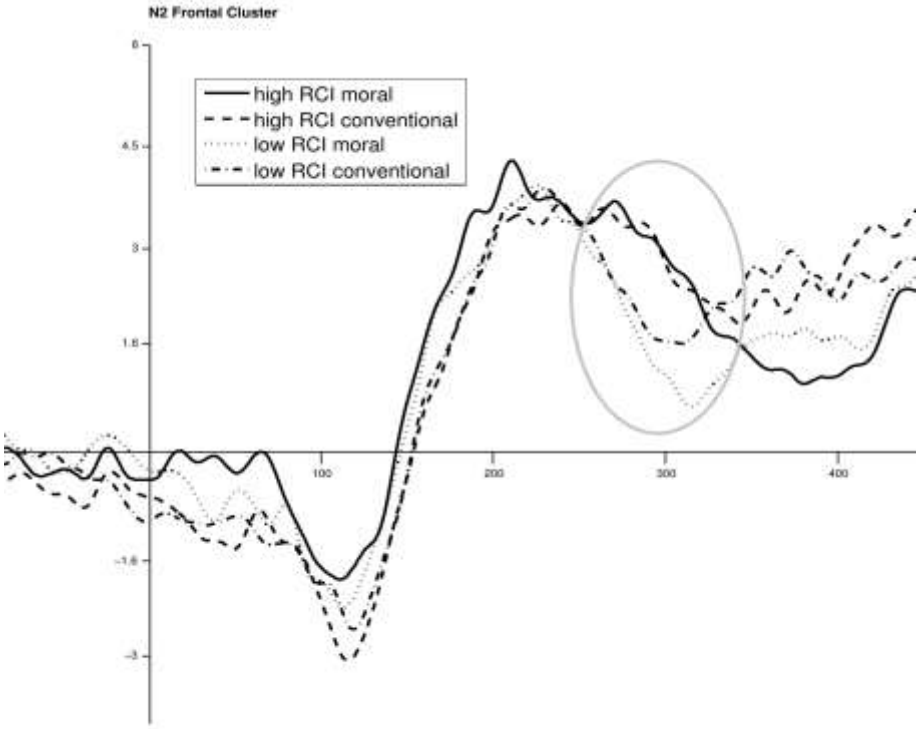


Figure 1. Electrode sites contributing to the N2 waveform**.**

type was non-significant, $F(2, 33) = 1.055$ $p = .354$, $\eta_p^2 = .031$. The main effect for RCI-10 score type was also non-significant, $F(2, 33) = 0.488$, $p = .508$, $\eta_p^2 = .013$. No significant mean differences were found to support my hypotheses.

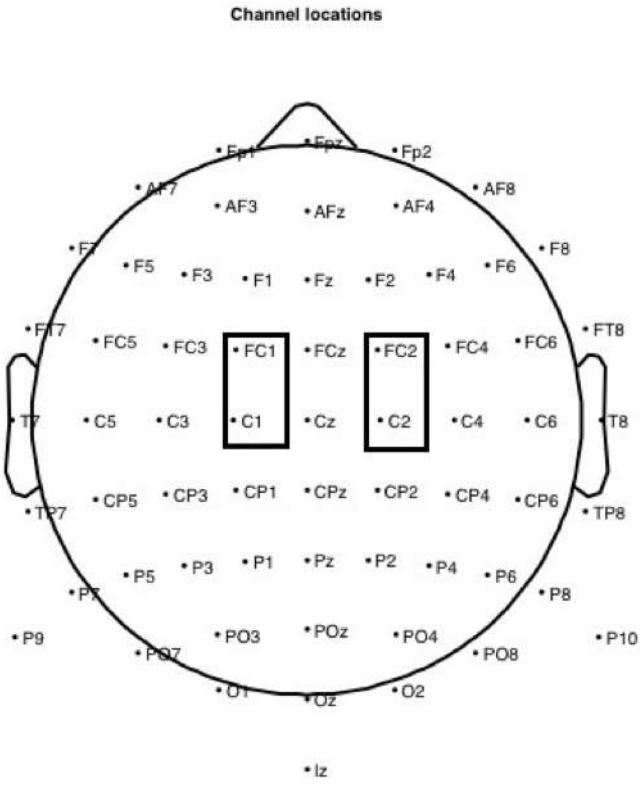
Figure 2. Grand average N2 potentials at the frontal cluster (FC1, FCz, FC2, C1, Cz, C2, CPz) for Moral and Conventional violations for participants with both High and Low RCI-10 scores.



The data was then examined for possible hemispheric neuroprocessing asymmetries. This sort of lateralization analysis is a best practice in ERP research, as many neurocognitive functions are localized to one hemisphere, and hemisphere asymmetries of neurocognitive function have been a common finding in neuroscience for over 150 years (Luck, 2005). Further, lateralization effects offer insight into how sensory stimuli are processed, and may provide additional information regarding my hypotheses. Previous studies suggested factors such as emotion and valence (Heller, 1993; Zhang, Zhou, & Oei, 2011) or specific characteristics about presented stimuli (Evans & Federmeier, 2007) were associated with differential processing across brain hemispheres. These factors are relevant to the current study, as emotion and valence have been found to produce differential processing of morally laden information (Decety and Cacioppo,

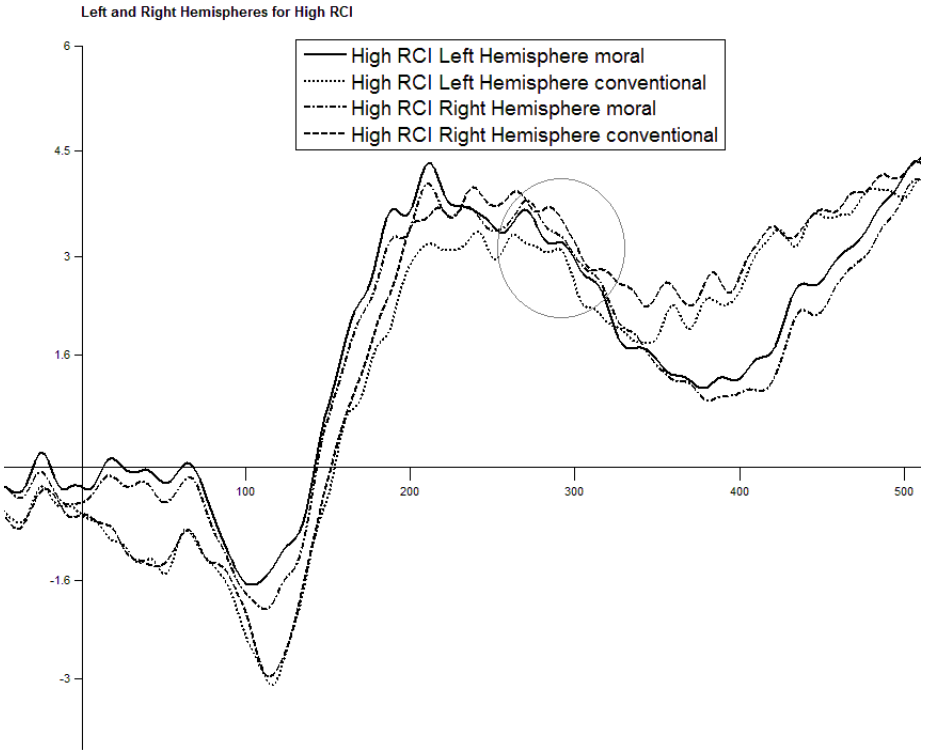
2012). Further, as was the case in Evans and Federmeier, the current study entailed verbal stimuli that were visually-presented, and thus, any hemispheric asymmetries found may be related to how distinctive characteristics of the stimuli are construed. Evans and Federmeier utilized ERP methodology in examining how the brain processes visually presented verbal information. These authors found the left hemisphere was associated with processing the visual stimuli more abstractly, whereas the right hemisphere more veridically.

Scalp topographical plots were examined from the grand-averaged data for all participants. This revealed arguable N2 components at central electrodes directly lateral to midline. ERP data were averaged across a cluster of electrodes in the left hemisphere (electrodes C1 and FC1) and a cluster in the right hemisphere (electrodes C2 and FC2; see Figure 3). The medial electrodes (FCz, Cz, and Cpz) were eliminated from this



analysis, as their placement is not a lateralized position about the scalp. A mixed-design 2 x 2 x 3 ANOVA with brain hemisphere (left, right) as a within-subjects factor, RCI-10 score (high, low) as a between-subjects factor, and dilemma type (moral, conventional, neutral) as another within-subjects factor revealed a main effect of hemisphere, $F(2, 1, 33) = 10.2$, $p < .003$, $\eta_p^2 = .236$, such that N2 amplitudes for the right hemisphere were larger than for the left hemisphere for all violations. This was qualified by interactions between (a) hemisphere and dilemma type, $F(2, 1, 33) = 3.99$, $p = .023$, $\eta_p^2 = .108$, such that amplitudes for the neutral condition were significantly lower than more and conventional violations in the left hemisphere while not differing significantly from either in the right hemisphere; and between (b) hemisphere, dilemma type, and RCI-10 score, $F(2, 1, 33) = 3.21$, $p = .047$, $\eta_p^2 = .089$, such that the participants in the high religious commitment group produced larger amplitudes for moral violations in the right hemisphere than the low religious commitment group, with moral violations significantly higher than neutral violations, but not conventional violations. A main effect for dilemma type was non-significant, $F(2, 1, 33) = 1.19$, $p = .308$, $\eta_p^2 = .035$ as was the main effect for RCI-10 score, $F(2, 1, 33) = 0.25$, $p = .617$, $\eta_p^2 = .008$. The interaction between hemisphere and RCI-10 score was non-significant, $F(2, 1, 33) = 0.72$, $p = .401$, $\eta_p^2 = .022$ as was the interaction between dilemma type and RCI-10 score, $F(2, 1, 33) = 0.86$, $p = .43$, $\eta_p^2 = .025$. Multiple within-subjects contrasts and examination of estimated marginal means plots were used to make post hoc comparisons between conditions. The first within subjects contrast examining the significant interaction of hemisphere, dilemma type, and RCI-10 score indicated there was a significant difference between moral and neutral dilemma types across brain hemispheres and RCI-10 scores, $F= 6.054$, $p = .019$,

Figure 4. Grand average N2 potentials at left (C1, FC1) and right (C2, FC2) hemispheres for Moral and Conventional violations for participants with High RCI-10 scores



η_p^2 = .155. This was significant at the Bonferroni-corrected α = .025. A follow up 2 x 3 repeated measures ANOVA (hemisphere, dilemma type) was then conducted, revealing a non significant hemisphere by dilemma type interaction, $F(1, 2) = 3.399$, $p = .039$, η_p^2 = .091 with a Bonferroni-corrected α = .0125. Coupling this finding with examination of the estimated marginal means plots revealed possible differences in means of dilemma types and hemispheres between religious commitment conditions. Additional 2 x 3 within subjects ANOVAs (hemisphere, dilemma type) were conducted examine possible difference between high and low religiously committed participants separately. The ANOVA examining the high religious commitment condition revealed a significant two way interaction, $F(1, 2) = 5.854$, $p = .007$, η_p^2 =.281 at the Bonferroni-corrected α =

.0125, whereas the low religious commitment ANOVA revealed a non-significant interaction, $F(1, 2) = 1.226$, $p = .305$, $\eta_p^2 = .064$. Simple contrasts for the ANOVA examining the high religious commitment group revealed an interaction of the difference between moral and neutral conditions and hemisphere of $F = 8.365$, $p = .011$, $\eta_p^2 = .358$ and an interaction of the difference between moral and conventional conditions and hemisphere of $F = 3.680$, $p = .074$, $\eta_p^2 = .197$. However, neither of these contrasts were significant at the Bonferroni-corrected $\alpha = .00625$. Given the lack of statistically significant results, evidence for a lateralized effect was not found, and no evidence was provided to support the hypotheses of the main analysis.

Figure 4. Estimated Marginal Means for High RCI-10 Scores

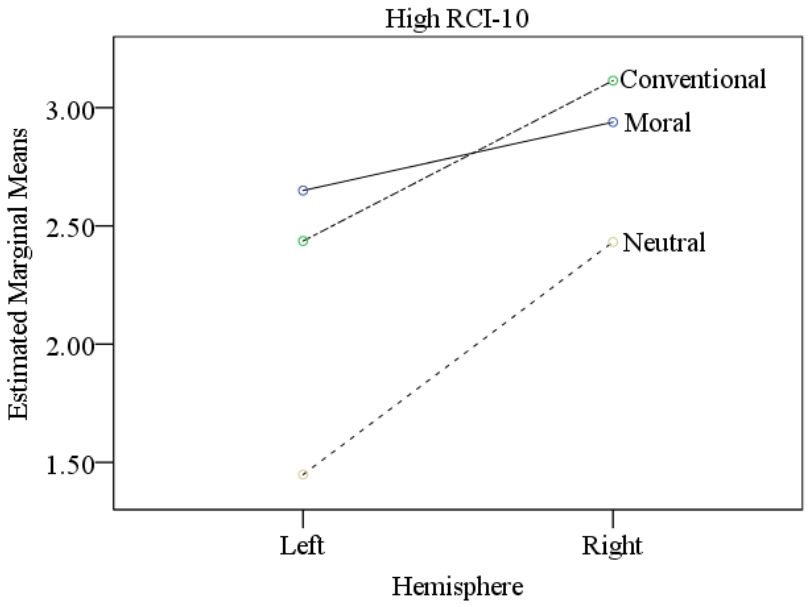


Figure 5. Estimated Marginal Means for Low RCI-10 Scores

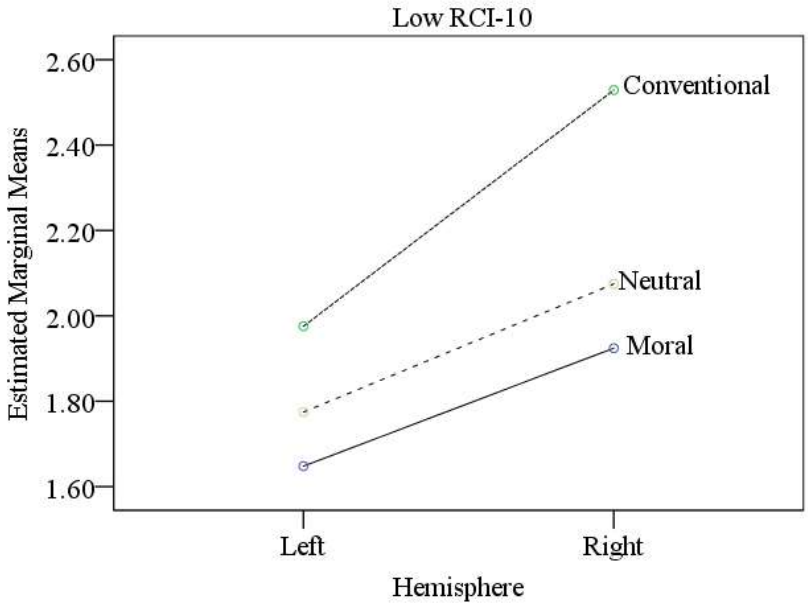


Table 1
Estimated marginal means of N2 amplitude by religious commitment, dilemma type and hemisphere

RCI-10	Dilemma Type	Hemisphere	*M*	Std. Error
Low	Moral	Left	1.65	.803
		Right	1.92	.794
	Conventional	Left	1.98	.697
		Right	2.53	.747
	Neutral	Left	1.78	.762
		Right	2.08	.764
High	Moral	Left	**2.65**	.875
		Right	**2.94**	.865
	Conventional	Left	**2.44**	.760
		Right	**3.12**	.814
	Neutral	Left	**1.45**	.830
		Right	**2.43**	.833

The results in bold represent significant RCI x Dilemma Type x Hemisphere interaction.

Discussion

In this study I examined how religious commitment impacts how the brain processes morally laden information, an important aspect in illuminating the relationship between religion and morality. This study contributes to extant literature on morality and religion in several ways. First, the measures (RCI-10; Worthington et al., 2003) and constructs (i.e., domain theory; Turiel, 1983) utilized in the study were chosen for their demonstration of adequate reliability and validity. Moreover, specific aspects of morality and religion were examined, which circumvented a common drawback within the literature: that much of the literature investigating the relationship between religion and morality arrive to the discourse with dissimilar or general constellations of meanings for morality and religion (McKay & Whitehouse, 2015). Second, despite an exhaustive review of the literature, I was not able to find any existing research that utilized ERP methodology in investigating how the relationship between religious commitment and moral violations is processed neurocognitively. Third, the use of ERP is of particular import, as the temporal resolution afforded with this methodology allows for examination of rapidly occurring neural activations in automatic processes such as cognitive conflict detection. Finally, ERP methodology, as opposed to survey research, is a more direct study of the brain. The use of ERP circumvents the validity threats inherent to survey research (e.g., demand characteristics, social desirability bias; Heppner, Wampold, & Kivlighan, 2008).

It was expected that non-religiously committed individuals would have more cognitive conflict (i.e., greater mean N2 amplitudes) for conventional violations than religiously committed individuals. This hypothesis was not supported; according to the

ANOVA, no significant difference in mean N2 amplitudes was found during judgments of conventional violations across religious commitment types. Moreover, no significant differences were found across religious commitment types during judgments of moral violations.

Though no significant differences were found with the ANOVA, examination of the waveforms from the frontal clusters (see Figure 2) may offer an alternative explanation of the findings that ANOVA may not be capable of detecting. Within the N2 time window, the highly religiously committed participants did not appear to produce an N2 during judgments of moral or conventional scenarios, whereas the non-religiously committed participants did. In this context, the lack of an N2 component in the waveform would suggest the religiously committed participants did not experience cognitive conflict (i.e., two competing interpretations of incoming information; Cohen, 2014), while the non-religiously committed participants did. In this context, the lack of cognitive conflict for the religiously committed participants may be indicative of a more readily available schema, allowing information to be processed without the deliberation of competing interpretations (see below for further discussion of readily available schema).

Further, the lack of N2 component in the religiously committed participants' waveform would also suggest the neural activity within this time window is likely the continuation of positive-going activity from the previous P2 component of the waveform. The P2 has been found to be an index of response to visual stimuli and as an index of implicit memory processing (Luck & Hillyard, 1994), with evidence demonstrating P2 amplitudes are modulated by attentional resources (e.g., higher resources recruited when more attention is paid to a visual stimulus; Luck & Hillyard, 1994) and the context of

language for visually presented verbal stimuli (Evans & Federmeier, 2007; Luck & Hillyard, 1994). Accordingly, it may be more appropriate to interpret the highly religiously committed participants' waveform as a P2 component rather than N2, as implicit memory processing may be indicative of accessing readily available schema or heuristics for interpretation of incoming information. However, the distinction of ERP components is beyond the scope of this study, and further research is needed to determine the accuracy of this interpretation.

For religiously committed individuals, increased activation in the right hemisphere was found for both moral and conventional violations. Interpreted in the context of the P2 component, this suggests greater allocation of neural resources for the right hemisphere (Luck, 2005), but it may also suggest a difference in the manner in which specific characteristics about the information is processed. Evans and Federmeier (2007) found greater right hemisphere activation indicated more straightforward, veridical processing of visually presented information, whereas greater left hemisphere activation indicated more abstract processing. Taken together, this may suggest a tendency for religiously committed individuals to process morally laden information in a more undissembled, concrete, and fact-based manner, which is also indicative of someone with a more readily available schema to arbitrate information as it is presented.

Worthington et al. (2003) stated this kind of accessible schema underlies the very concept of religious commitment—that religiously committed individuals possess these schemas and evaluate their everyday existence through them. Support for this assertion is consistent across the literature. Duriez (2003, 2004) found religious people are more likely than non-religious people to embrace traditions, order, and structure; espouse

culturally conservative, authoritarian beliefs; and ascribe importance to the expectations of authority figures when making crucial life decisions. Shariff, Piazza, and Kramer (2014) found theists believed their deity was the source of justice as well as being the author of morality itself, and Lupfer, Brock, and DePaola (1992) found religious participants tended to make more religious-heavy attributions to observed behavior (i.e., attributing behavior to "God" or "Satan" as causal agents) when they were more committed to their religion.

Limitations

One limitation of this study was its cross-sectional nature, which did not allow for longitudinal examination of moral reasoning processes. Future research should examine how these processes may change or develop over time due to biophysical variables (e.g., neuronal maturation or brain insult) or psychosocial variables such as changes in religious beliefs. This study was also limited in that the participants were predominantly younger adult, female, and Caucasian. Moreover, most of those who identified as religious affiliated themselves as Roman Catholic. While this study (a) found no significant neural processing differences across gender, and (b) utilized the same age group on which the scenarios were normed, future research should utilize a more ethnically and religiously diverse sample of varying age and gender identification.

Implications for Counseling Psychology and Directions for Future Research

Worthington et al. (2003) stated religious commitment should be considered when forming intervention strategies for clients, as religiously committed individuals view events from their lives in terms of their religious beliefs. I found coinciding evidence in the present study, as religiously committed individuals produced waveforms suggesting

they accessed readily available schemas and arrived at judgments without cognitive conflict. Considering this evidence, religiously committed clients may arrive at religiously aligned interpretations of life events readily and rapidly. Importantly, while religious belief is often highly associated with wellness, one's interpretation of life events through a religious lens may also be potentially detrimental (Pargament, 2001). Pargament offers suggestions of how to work with potentially problematic religious interpretations of life events (i.e., negative religious coping) while remaining culturally sensitive with religious clients. This includes using Socratic dialogue or posing interposing competing tenets from within a client's religious teachings. These efforts serve to challenge a current interpretation in order to engender a different way of perceiving a given situation. However, the current findings would suggest interventions relying entirely on effortful or deliberate reasoning (e.g., Socratic dialogue) may not be as effective in challenging these interpretations as experientially oriented interventions might, if the interpretation occurs prior to conscious awareness. Future research should examine possible differences in treatment effectiveness in working with highly religiously committed clients.

Activism and Social Justice. Another implication pertains to activism and considerations of social justice. In their seminal paper, Vera and Speight (2003), called on all counseling psychologists to be grounded in a commitment to social justice. To this end, these authors included a call for expansion of our roles beyond that of counselor and psychologist to include activist. While understanding how therapy clients think and reason (including moral reasoning) is imperative, if counseling psychologists are to assume the role of activist, understanding moral psychology and moral reasoning will

also be pivotal in understanding and addressing the foundations for the resistance that is likely to be encountered in pursuit of social justice ideals (Haidt, 2007). If, for instance, social justice ideals contravene a religious belief structure, mediating the resistance may require more than ratiocination or dialogue if individuals arrive at opposing positions on a more implicit level of processing.

Disruptions in Moral Functioning. One salient point where understanding our client as meaning makers emerges is in addressing moral injury. Moral injury is a term coined to describe the disruption of deeply held beliefs about the world brought on by perpetrating, bearing witness to, or failing to prevent actions or inactions that challenge one's moral code (Litz et al., 2009). The psychological consequences of moral injury are dire. Moral injuries are marked by functionally impairing levels of moral emotions (e.g., guilt and shame), self-handicapping behaviors (e.g., avoidance, substance abuse), demoralization, and self-harm, that are brought on when an event disrupts deeply held beliefs about how the world *is* and *ought* to be (i.e., moral beliefs; Litz et al., 2009; Farnsworth, et al., 2014). For many, these disrupted belief structures center on religious beliefs (Litz et al., 2009, Farnsworth, et al., 2014), and the findings of the present study offer a potential mechanism to explain how religiously themed moral injuries could result in adverse psychological outcomes. That is, morally injurious events may discompose previously readily available interpretations of incoming information, resulting in unresolved cognitive conflict that may actuate any number of psychological sequelae. Future research should endeavor to examine how this unresolved cognitive conflict might determine later processing and result in negative psychological outcomes.

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Appendix A – Literature Review

Morality is a perennial philosophical issue concerning the very nature of what is good. As humans, we have historically glorified our ability to reason, holding virtuous our ability to conquer our emotions and passions through logic and mental discipline (Haidt, 2013). Kohlberg (1976, 1981) embodied this reverence for rationalism in his foundational model of moral reasoning, however, research is emerging belying established conceptualizations of human moral functioning. Rather than reason alone, evidence now exists that our moral judgments occur as an interaction of other influences and processes (Greene et al., 2002; Haidt, 2001; Moll, 2005). Recently armed with brain imaging technologies such as electroencephalography and functional magnetic resonance imaging (fMRI), the body of moral neuroscience literature has burgeoned, increasing our understanding of the neural processes involved in moral functioning, and specifically with the use of event related potential (ERP) methods, the various inputs along the rapid time course of moral functioning are being revealed (Yoder & Decety, 2014).

Religion was historically thought to be inextricably linked to morality, although recent studies have revealed a complex and even indirect relationship between morality and religiosity (Baumsteiger, Chennevile, & McGuire, 2014; McKay & Whitehouse 2015). Presumably, both religious values and morality tap into individuals' most deeply held beliefs and attitudes about the world, guiding thought and influencing action. Within a counseling environment, both religion and morality are of paramount importance as they are pivotal in informing the nature of a disorder, the aims for therapy, and the course of treatment (Benish, Quintana, & Wampold, 2011; Worthington, 1988). However, I was not able to find any existing research examining the neural correlates of morality and

religiosity, specifically with ERP methods allowing for the high temporal resolution necessary to examine the rapid sequential activation of neural areas in the time course of moral processing.

Moving from Rationalism

With increased use of neuroscience technologies over the previous two decades, a growing body of literature has emerged examining how the brain processes morally laden stimuli (Greene et al., 2001; Moll et al. 2005). This increase in information has led to a paradigm shift in our understanding of the processes of moral decision making (Haidt, 2013). The regnant model of moral decision making for much of the late previous century was the Kohlberg (1981) rationalist model of moral development. Kohlberg (1976) developed an interviewing method which he used with both adults and children to examine how they went about resolving hypothetical moral dilemmas. Kohlberg (1981) found that individuals' development of moral reasoning occurs in increasing rational sophistication over six total stages. More specifically, he stated there are three levels (pre-conventional, conventional, and post-conventional) with two stages nested within each level. Kohlberg (1981) stated individuals begin their moral development as pre-conventional children who are driven by egocentric motives and with judgments that are primarily concerned with how actions might bring about good or bad consequences to the self. As the child's cognitive abilities expand, however, judgments about actions begin to involve incorporating the perspectives and interests of others. This increased development first allows for an understanding of others' needs on a conventional level, then a more powerful and nuanced post-conventional level.

The differences among Kohlberg's (1981) six stages of moral development lie in how individuals reason about the nature of justice and fairness. Kohlberg's model stated the preconvention level centers on egoistic concerns, begins around age five, and is comprised of two stages: (a) the reward/punishment orientation and (b) the naïve reciprocity orientation (Bergen, 2008). At the preconventional level individuals' interpretation of justice within the reward/punishment orientation is centered on the perceived reward or punishment that an action will bring about, and the naïve reciprocity orientation is centered on responding to good acts in kind or retaliating to acts that have caused harm (Bergen, 2008). The conventional level (Kohlberg, 1981) usually stabilizes around age 13 and is comprised of the two stages: (a) the good girl/boy orientation and (b) the authority or social order maintenance orientation (Bergen, 2008). The interpretation of justice within the good girl/boy orientation centers around maintaining approval of others through actions, and the authority and social order maintenance orientation centers on obeying authority and maintaining the social order as it is (Bergin, 2008). Finally, individuals at the postconventional level begin to conceptualize justice and fairness in the abstract, developing more sophisticated and less egoistic senses of right and wrong (Kohlberg, 1981). Kohlberg found this level of moral reasoning usually develops in healthy individuals around ages 16 to 18. The two stages within the postconventional level are (a) the contract and democratic law orientation and (b) the conscience or principle orientation (Bergen, 2008). Interpretations of justice and fairness within the contract and democratic law orientation center around maximizing social welfare by fulfilling one's duties as a citizen, and the conscience or principle orientation

centers on acting in ways that are guided by higher universal principles that maximize universal human rights (Bergen, 2008).

Kohlberg's model was not without criticism. Turiel (1983; 2008) expounded on differences between social conventions (i.e., rules that are culturally dependent, change across social groups, and serve to facilitate social coordination) and morals (i.e., universally held rules that are held above social and political authorities). Further, Turiel demonstrated that children were capable of distinguishing the difference between violations of morality and violations of social conventions as early as preschool, much earlier than Kohlberg (1981) described. Moreover, Smetana (2006) demonstrated this capability emerges in individuals as early as 39 months old.

Other competing theoretical models were proposed in the latter part of the last century, which began subtly parsing the human moral experience into dissociable components (cf. Jones, 1991). For example, in Rest (1986) a four-component model of the psychological processes for healthy moral functioning was proposed. Moving beyond an emphasis on only moral judgment, the four components of Rest's (1986) model are (1) moral sensitivity, referring to one's ability to recognize a moral issue; (2) moral judgment, referring to the ability to arrive at a decision about an issue; (3) moral motivation, which entails placing moral concerns ahead of other concerns; and (4) moral character, which involves acting on one's decision. Further, Blum (1994) expounded that moral sensitivity is comprised of other facets like moral perception, moral imagination, and empathy. Moral perception includes picking up relevant context-dependent cues to morally laden stimuli and is facilitated with increasing expertise; moral imagination entails the ability to envision different moral scenarios as well as the sequelae of each

moral action; and empathic sensitivity refers to one's ability to perceive the emotional state of another person, triggering an emotional arousal to their experience, which often compels action (Blum, 1994).

While Rest (1986) offered an expanded model that circumscribed other considerations of moral functioning, like Kohlberg (1981), Rest postulated moral judgment occurred only within the cognitive domain. In fact, Kohlberg, Levine, and Hewer (1983) contended that no single behavior has any particular moral standing unless it is driven by an explicit and deliberate moral judgment. This emphasis on cognitive processes during moral judgment drew criticism (Haidt, 2013; Wilson, 1993), as Kohlberg's model was thought to myopically constrain moral functioning to reason alone. As will be explained in ensuing sections, a paradigm shift occurred to begin including other influences and processes (e.g., emotional processes, evolutionarily adapted sensitivities) involved in human moral functioning (Moll et al., 2005). As the body of research on human moral reasoning grew, several other empirically grounded theories of moral function arose (Cushman et al., 2006; Greene et al., 2001; Haidt, 2001; Moll et al., 2005; Waldmann & Dietrich, 2007), each espousing the notion that moral judgment occurs when a transgression or moral violation triggers a specific moral computation, but not necessarily within only a cognitive domain. For example, Greene et al. (2001) discovered brain areas associated with emotional processing were activated during moral reasoning tasks and are likely included in the moral reasoning calculus. He described a dual process model in which moral violations activate automatic, emotional processes that influence or even compete with controlled cognitive processes in arriving at a judgment. Haidt (2001) invoked social influence as well as affective processes with

his social intuitionist model. Similar to the dual process model, Haidt's (2001) model stated that moral violations trigger an automatic, pre-cognitive intuition which is followed by ex post facto reasoning. Haidt stated these intuitions occur rapidly and without conscious deliberation, even possessing an affective valence about the situation. Moreover, he stated reasoning only occurs in the face of social pressures calling for one to explain the intuition. In other words, a judgment arises automatically and rapidly, and reasoning occurs more slowly and only when faced with social pressures calling for justification. Put simply, evidence was emerging that there is more to moral judgment than conscious reasoning alone.

Moral Reasoning and Neuroscience

Green et al. (2001) was pivotal in shifting focus toward examining moral functioning with objective neuroimaging technology. He utilized functional magnetic resonance imaging (fMRI) while participants deliberated hypothetical dilemmas. Two classic dilemmas were used for this study. The first was the Trolley dilemma where a runaway trolley careens down a track and is headed straight for five people on the track. The trolley will kill all five people unless a button is pressed to divert the trolley car to a different track. The only problem with pressing the button, however, is that there is one person on the other track who will inevitably be killed by the trolley. Herein lies the dilemma: should one do nothing and let five people die? Or, should one intervene and save the five people but kill one person? The other dilemma used in this study is called the footbridge dilemma. Like the trolley dilemma, a runaway trolley car is headed for five people, however, in this instance you and another large individual are atop a footbridge which spans the railroad tracks. The only way to stop the trolley and save the five people

would be to push the other person onto the tracks. The person you push onto the tracks would die in the process, but the other five people would live. In both dilemmas the same number of people would live or die, and yet, as Greene et al. (2001) summarized, most people are quick to agree with pushing a button to divert the trolley car, whereas most people hesitate to endorse pushing one person off the bridge to save many others. Greene et al. (2001) argued the difference lies in how dilemmas like the footbridge scenario engage emotional processing systems, preventing judgments from arising by pure reason alone. Greene and colleagues distinguished these dilemmas as moral-personal and moral-impersonal, with the moral personal dilemmas activating emotional processes that compete with cognitive processes. Moreover, the authors stated utilitarian judgments (i.e., when the consequences of an action are used to justify the means of an action) to moral personal dilemmas, like the footbridge dilemma, are only possible when rational systems override the emotional coloring of the judgment.

The use of fMRI served to establish the utility of neuroscience methods as a way to understand human morality in ways that would otherwise be impossible. But while seminal in shifting the paradigm of moral reasoning research, the moral-personal/moral-impersonal distinction from Green et al. (2001) drew criticism as being too vague (Lotto, Manfrinati, & Sarlo, 2014; Moll et al., 2005). Lotto, Manfrinati, and Sarlo cited Thomas Aquinas' (1952) Doctrine of the Double to explain the difference in emotion activation, which states that it is not allowable to intentionally cause harm for the greater good, but it is allowable if the harm to someone else is an unintentional but anticipated consequence. Lotto and his colleagues replicated the findings of Greene et al. (2001) but differed in that they parsed the difference in moral dilemmas not as moral-personal versus moral-

impersonal, but as "instrumental," in which another person's well-being is used as an instrument in the dilemma's resolution, versus "incidental," where another person's death is an unintentional but anticipated consequence in resolving the dilemma.

Much of the research in moral science literature involves the use of dilemmas, as they are thought to evoke participants' most deeply held attitudes and beliefs. (Greene, 2001; Kohlberg, 1967; Lotto, Manfrinati, & Sarlo, 2014). It should be noted, however, that the use of the classic footbridge and trolley dilemmas may be problematic. Turiel (2008) offered the criticism that these scenarios force participants to resolve a moral dilemma by committing a moral violation, which complicates how the moral judgments and deliberations may be interpreted. Consequently, findings based on these scenarios may not generalize to more mundane, but otherwise morally laden, dilemmas. Other dilemmas were developed to bypass this concern (e.g., Lahat, Helwig, & Zelazo, 2013), which entailed more commonplace social interactions that did not force participants to imagine committing a moral violation but still centered on issues of prevention of harm or maintenance of fairness. For example, Lahat and colleagues asked participants to judge (by indicating either "ok" or "not ok") a resolution to a social interaction (e.g., a young boy is eating dinner with his family and started fighting).

Another consideration in using dilemmas to examine moral functioning lies in how the scenarios are presented to the participant. Within the moral cognitive neuroscience literature, the scenarios tend to be either presented as a series of images depicting morally laden scenarios (Decety & Cacioppo, 2012; Escobar et al. 2014; Keil et al., 2002; Olafsson et al., 2008; Yoder & Decety, 2014) or narrative presentations of the dilemmas (Kohlberg, 1981; Lehat, Helwig, & Zelazo, 2013; Van Berkum et al., 2009).

Depicted moral scenarios allow for a swift presentation of the moral stimulus (Decety & Cacioppo, 2012), which conduces to research examining the time course and temporal dynamics of moral functioning. Further, a large body of moral neuroscience literature addresses the neural processing of pictures (Keil et al., 2002; Olafsson et al, 2008). However, narrative presentations confer advantages as well. Specifically, (a) language is a more precise way to make people think about abstract concepts and terms (Van Berkum, 2008), (b) more eye movements and neuroimaging artifacts will occur with picture presentations over screen-centered, word-by-word presentations (Luck, 2005), and (c) well-designed tests allow for temporally focused critical events in the input stream (Van Berkum et al., 2009).

The body of moral neuroscience literature has seen profound growth in the previous 20 years. Early after the turn of the century, evidence converged to suggest agreement on the neural basis of human moral functioning (Moll et al., 2005). The review presented by Moll et al. drew from the most salient initial neural correlate studies, including brain lesion studies (e.g., Damasio, 1994) which showed individuals with damage to the ventromedial prefrontal cortex (vmPFC) were unable to incorporate affect in their moral decision making. Included also was Greene et al. (2001), who found that cognitive control processes occurred in the lateral PFC and the anterior cingulate cortex (ACC), and emotional processing occurred in the medial PFC, posterior cingulate cortex (PCC), and the superior temporal sulcus (STS). Later studies supported these earliest findings (Chen et al. 2009; Escobar et al., 2014; & Yoder & Decety, 2012), and Moll et al.'s seminal review highlighted the convergence of the data, allowing for a more unified conceptualization of human morality's neural basis. Specifically, Moll et al. indicated the

following neural areas are implicated in moral functioning: (1) the anterior PFC, which includes the frontopolar cortex; (2) the orbitofrontal cortex (OFC), especially the medial sector; (3) the posterior STS, (4) the anterior temporal lobes, (5) the insula, (6), the precuneaus, (7), the ACC and PCC, and (8) limbic and paralimbic regions.

Toward a neural model of human morality. Moll et al. (2005) was also pivotal in summarizing the extant theoretical frameworks that sought to account for variability in moral reasoning. In its nascence, the literature on moral neuroscience was a collection of inchoate and incomplete models. As will be described in the following section, there was a lack of agreement among theorists regarding constructs and terminology. Moll et al. was pivotal in that he combined the disparate literature into a concisely curated summary and integration.

Somatic marker hypothesis. The first summarized framework, the somatic marker hypothesis, is primarily drawn from Damasio's (1994) study of individuals with vmPFC damage. The participant's inability to make felicitous moral decisions in their everyday lives despite being able to evaluate moral dilemmas in the abstract was thought to be a result of their lesioned vmPFCs. The somatic marker hypothesis asserts individuals with vmPFC damage are unable to automatically "mark" everyday morally laden decisions as either advantageous or pernicious. This hypothesis effectively integrated emotion and cognition while allowing for testable predictions, but it is limited in that it does not account for other neural areas implicated in moral functioning. Further, it does not account for different PFC areas that appear to have dissociable processes in moral functioning.

Social response reversal. Moll et al. (2005) then described the Blair and Cipolotti (2000) social response reversal framework, which sought to explain social behavioral impairments in patients with OFC lesions. Blair and Cipolotto (2000) were influenced by Rolls et al. (1994) who found that patients with OFC damage had difficulty with response reversal tasks. Rolls et al. described one response reversal task that included (a) having participants learn that touching one stimulus on a screen resulted in a reward while touching a different stimulus on a screen resulted in a punishment, and then (b) observing participants after the contingencies were unexpectedly reversed. The OFC is implicated in "rapid stimulus-reinforcement association learning as well as the correction of these associations when reinforcement contingencies in the environment change" (Rolls, 1996, p. 1437). Moreover, patients with OFC damage tend to make more errors on response reversal tasks (Rolls et al. 1994). Blair and Cipolotti examined a patient presenting with *acquired sociopathy* following trauma to the right frontal region which included OFC damage. The patient's behavior was described as aberrant and marked by high levels of aggression and callousness toward others, and the patient was unable to recognize facial expressions of anger and disgust in others. However, the patient remained unimpaired in response reversal tasks. The unimpaired response reversal abilities led Blair and Cipolotti to argue for a social response reversal mechanism, which, in individuals with OFC damage would prevent the activation of a violence inhibition mechanism (VIM) when faced with the perception or expectation of another's anger. The VIM, as described by Blair and Cipolotti is a product that emerges from a neural system involving the OFC and amygdala, marking the role of the amygdala in aversive conditioning and moral socialization. Further, these authors state that failures of VIM activation would be

endemic to developmental psychopathy and explain the instrumental aggression observed in this population. This model provides utility in its ability to predict behavioral outcomes as a result of OFC and amygdala damage, but it cannot account for deficits in moral functioning that stem from damage to other neural areas.

Failure of theory of mind. A third framework described by Moll et al. (2005) was called "failure of theory of mind." Theory of mind (ToM) is defined as one's ability to understand the mental states (i.e., beliefs, intents, desires, etc.) of others, and to understand that these mental states are different from one's own (Premack & Woodruff, 1978). The failure of theory of mind framework arose primarily from observing antisocial behavior and failure on ToM tasks seen in a patient with frontotemporal dementia (Lough, Gregory, & Hodges, 2001). The patient's brain exhibited bilateral atrophy of the OFC and anterior temporal lobes which included the amygdala. The personality changes and deficits of theory of mind resonate with what may be called abnormal moral functioning, specifically the ability to assume another's perspective. However, this theory fails to account for all of the variation in antisocial behavior as theory of mind remains intact in individuals with psychopathy.

Structured-event-complex framework. The structured-event-complex (SEC) framework (Grafman, 1995) relies on the assumption that executive functions performed by the PFC are based on sequence event knowledge that is stored in the PFC. SECs are defined as "long-term memories of event sequences that guide the perception and execution of goal-oriented activities" (Moll et al., 2005, p. 803), and can entail activities like planning a dinner party or all of the details and subroutines involved in going to the grocery store. Further the SEC framework predicts that different partitions of the PFC are

involved in storing different domains of event knowledge. Specifically, social and emotional SECs are associated with the vmPFC, novel and multitasking SECs are associated with the anterior PFC, and overlearned SECs like tying shoes are associated with more posterior regions of the PFC. This theory is crucial in its ability to account for long term and goal-oriented behavior, however, it is limited in that it cannot account for associations between the PFC and other neural areas, especially the limbic areas, in moral functioning.

Moral sensitivity hypothesis. Studies involving showing participants' depictions of moral violations (e.g., Moll, Oliveira-Souza & Eslinger, 2003) were shown to activate aPFC areas, medial OFC areas, the STS region, and brainstem and limbic structures. These automatic activations served to drive the moral sensitivity hypothesis: that humans are equipped to regard certain social events with moral values. This model converges with other moral reasoning studies implicating PFC and STS regions, however, it is limited in that it makes no predictions about the kinds of moral cognition impairments expected to see following damage to specific areas of the OFC, PFC, and STS.

A comprehensive neural model of human morality. Integrating the strengths and circumventing the limitations of the frameworks into an overarching model, Moll et al. (2005) proposed the event-feature-emotion-complex (EFEC) framework. Moll and colleagues propounded the idea that three constructs interact to allow moral cognitive phenomena to emerge:

1. Structured event complexes which are context-dependent representations of events and event sequences in the prefrontal cortex (PFC);

2. Social and functional features which is context-independent knowledge (i.e., semantic and featural knowledge) implicating the anterior and posterior temporal cortex; and
3. Central motive and emotional states, which entail the context independent activation of motivational and emotional states in limbic/paralimbic structures.

According to Moll et al. (2005), structured event knowledge is stored in different subdivisions of the PFC depending on the type of event knowledge, with novel and more difficult multitasking events associated with more anterior areas of the PFC (e.g., long-term goals and multi-stage events like making plans and thinking about the future). Social and emotional event knowledge are associated with ventromedial PFC areas which are fundamental in formation of attitudes and social stereotypes, and overlearned sequences (e.g., tying one's shoes or zipping a coat) are associated with medial and posterior PFC areas. Social perceptual and functional feature knowledge pertains to extracting social information (i.e., social perceptions, like facial expression, prosody of speech, gaze, body posture, and gestures) as well as functional features of the environment. These specific areas serve as a sort of *social decoding* mechanism, as navigating our everyday social worlds requires the processing of vast amounts of information in the form of countless moral appraisals. Information from the world is extracted and processed by these brain areas, giving rise to the moral appraisals necessary for navigating social situations, "social functional features code for context-independent semantic properties that are extracted from different social situations" (Moll et al., 2005, p. 805). Finally, central motive states (e.g., aggression, guilt, shame, etc.) serve to provide emotional coloring as a basic mechanism for motivation. Researchers have found these motive and emotional

states are consistently associated with limbic and paralimbic areas (e.g., Decety & Howard, 2013; Greene et al., 2001). The feelings elicited from these areas also serve important social navigational functions. For instance, guilt may arise when someone perceives failure to uphold a societal standard, whereas pride may be experienced when a societal standard is perceived to be upheld.

It is important to note the Moll et al. (2005) model of human moral cognition allows for the integration of culture with moral reasoning. It follows that religion, a salient cultural input, would dovetail into the model in at least two possible ways. First, it would inform the type of context-dependent structural event-knowledge stored in prefrontal areas, "the PFC has a central role in the internalization of moral values and norms through the integration of cultural and contextual information during development" (Moll et al., 2005, p. 804). Second, it would inform the context-independent semantic knowledge housed in the pSTS during the extraction of social functional information in different social situations.

Goncalves and Perrone-McGovern (2014) described a model possessing some functional overlap with the Moll et al. (2005) model. For example, Goncalves and Perrone-McGovern implicated the vmPFC and temporal parietal junction (also reported in the literature as the pSTS [Decety & Caccioppo, 2012]) as a components of the Default Mode Network.

> "the social cognition network is a Default Mode Network connecting the mechanisms involved in spontaneous rest activity between the temporal parietal junction, posterior cingulate cortex, and ventral medial prefrontal cortex, areas of the brain that are associated with self-representation and theory of mind

> processes. Disruption of these networks has symptomatic expressions such as social inadequacy, attachment deficits, or lack of empathy (e.g., Autistic Spectrum Disorders)" (Goncalves & Perrone-McGovern, 2014; p. 509).

Though not specifically a moral reasoning model, attachment deficits and lack of empathy are distinguishing characteristics of deficient moral functioning (Decety & Howard, 2013). Moreover, this functional overlap speaks to affective and cognitive inputs that may be necessary to moral reasoning (Decety & Cacioppo, 2012; Greene et al., 2001). Furthering this point, Decety and Cacioppo cautioned against considering the function of these brain areas as unique to moral reasoning, "moral reasoning seems to be underpinned by specific neural circuitry, but, in fact, these circuits…involve regions and systems underlying specific affective states and cognitive and motivational processes" (p. 3068).

The virtue of event-related potentials

The identification of the underlying brain areas was an essential first step in understanding the cognitive neuroscience of human moral functioning. This first step was also important for counseling psychologists because it offers at the very least a biophysical marker for specific deficits in healthy personal and interpersonal functioning. Moreover, with these underlying components identified, an examination of the temporal dynamics (i.e., how these areas activate in sequence over time when processing morally laden information) became possible. Neuroimaging techniques such as fMRI were crucial in identifying the neural areas of human moral cognition, however, their utility is limited in that these techniques have very low temporal resolution and may fail to capture all of the activations—and sequences of activations—of neural areas and systems in the rapid

time course of moral reasoning (Yoder & Decety, 2014). As such, it may be of limited utility in examining how the components of the Moll et al. (2005) model activate in sequence to produce moral functioning. Indeed, the prefrontal areas implicated in the aforementioned moral reasoning models are activated very rapidly post stimulus onset. During moral reasoning tasks Decety and Cacioppo (2012) found the vmPFC was activated between 182-304 ms post stimulus, and Lahat, Helwig, and Zelazo (2013) found general activation of prefrontal areas between 200-500ms post stimulus. Considering this limitation, electroencephalographic (EEG) techniques, specifically those examining event-related potentials (ERPs) may be uniquely suited to examine moral reasoning's rapid time course, as the temporal resolution of these techniques can be at the 1 ms level (Yoder, & Decety, 2014).

Yoder and Decety (2014) demonstrated the immense utility inherent to ERP as they were able to show how processes once thought to be inextricably linked may actually be activated at separate points in the time course of moral functioning. Specifically Yoder and Decety found that areas implicated in valence appraisal were activated prior to activation of areas implicated in emotional processing. In other words, their study suggested people judge stimuli as good or bad prior to any emotional coloring of the reasoning process. This finding has profound implications for our understanding of human morality. Specifically, it suggests valence appraisal to be evolutionarily adaptive in how we navigate our world, it opens the door for examination of possible influences and inputs not otherwise understood to be part of our moral calculi, and it speaks to the importance of examining the temporal dynamics of moral functioning with high temporal resolution (Yoder & Decety, 2014). For example, Moll et al. (2005) posited cultural

information shapes moral functioning. If, however, cultural inputs such as one's religion shape and influence moral functioning, fMRI may be unable to isolate the neural areas and systems involved if they activate more rapidly than the temporal resolution afforded by fMRI.

What is ERP? Having made the case for ERP's utility in investigating the time course of human moral functioning, a discussion about the nature of ERP is warranted. Brain ERPs are a detection of the electric field generated on the scalp by the movement of ions within neural mass in fixed temporal relation to the arrival of information or movement (Brandeis & Lehmann, 1986). ERPs must be distinguished from evoked potentials which reflect sensory processing; ERPs evaluate neural activity in response to a certain event (Hruby & Marsalek, 2003). Further, ERP research is predicated on the premise that psychological processes leading to the completion of a certain task require changes in content of thought and attention, and these are evident in changes of electrical activity that neural systems generate (Hruby & Marsalek, 2003).

ERPs are measured with the use of electroencephalography (EEG), which entails placing electrodes in specific places about the scalp using a conductive gel (Landa et al., 2014). The EEG data is examined before, during, or after stimulus onset, and potential differences between pairs of electrodes (with one electrode recording) are sampled several hundred times per second (Brandeis & Lehmann, 1986). Electric scalp fields vary over time in both strength and location, providing a topography of electrical activity, and offering spatial and temporal information about processing in relation to time-locked stimuli (Brandeis & Lehmann, 1986). Time-locked stimuli are important to ERP research

because ERPs are reported as an average of multiple EEG readings from multiple exposures to the same stimulus. (Landa et al., 2014).

The N2 Component. Time windows of ERPs are subdivided into components. Peaks and troughs of the waveforms are traditionally thought of as components that reflect maximal activation of brain processes in response to the stimulus (Brandeis & Lehmann, 1986). Past researchers have established that the N2 component is a negative-going wave that peaks between 200 and 350 ms post stimulus onset and is an index of cognitive conflict detection (Folstein & Van Petten, 2008). Cognitive conflict occurs when multiple competing actions are considered, with only one of these actions being selected as the appropriate course of action (Cohen, 2014). The N2 is usually generated at medial-frontal sites and is larger when cognitive conflict is high (Azizian, Freitas, Parvaz, & Squires, 2006; Botvinick, Braver, Barch, Carter, & Cohen, 2001). Cognitive conflict, as detected by N2 activation, has been commonly studied with the use of go/no-go tasks that entail a tendency to make prepotent but incorrect responses (Donkers & van Boxtel, 2004; Nieuwenhuis et al., 2003). However, the N2 is not elicited specifically to go/no-go tasks. Botvinick et al. reviewed the literature on N2 as an index of cognitive conflict monitoring with studies using response competition, adjustments in perceptual selection, and maintenance of contextual information. Lahat, Zelwig, and Zelazo (2013) also observed N2 activation in both children and young adults during tasks that involved judging morally laden scenarios. Source localization analyses have implicated ventral PFC areas (e.g., orbitofrontal cortex) and dorsomedial PFC areas (e.g., dorsal anterior cingulate cortex [ACC]) during N2 activation (Bokura, Yamaguchi, & Kobayashi, 2001; Nieuwenhuis et al., 2003).

It should be expected, then, that N2 components will be observed over frontal brain areas during moral reasoning tasks, as these tasks likely require participants to weigh potentially competing information. That is, moral reasoning tasks may require weighing potentially competing interests between parties. Moreover, it should be expected that with higher cognitive conflict (e.g., the greater the number and profundity of considerations), higher N2 amplitudes would be observed.

Brain Hemisphere Asymmetries. An important aspect in examining how the brain processes information (e.g., ERP studies) lies in how the brain's hemispheres often process stimuli differently. Previous studies suggested factors such as emotion and valence (Heller, 1993; Zhang, Zhou, & Oei, 2011), or specific characteristics about presented stimuli (Evans & Federmeier, 2007) were associated with differential processing across brain hemispheres. Evidence of brain processing asymmetries for specific tasks arose as early as the mid 1800s with Broca's groundbreaking work on the localization of language production (Joynt, 1966). Broca localized a specific area of the brain (i.e., Broca's Area) after examining two patients who had both lost their ability to speak after suffering insult to the same neural area in the left hemisphere. Neural processing asymmetries are many (Hellige, 1993), and among the most germane to the current study are the ones produced during visual perception and language neurocognitive tasks. Neuroscience research on visual perception asymmetries emerged as early as 50 years ago, as Kimura (1966) discovered the left and right hemispheres produce differential processing of visual information. Kimura presented participants with random successions of letters or non-alphabetical stimuli to either the right or left visual fields. Kimura found that participants were able to more accurately identify letters when

presented in the right visual field, whereas the non-alphabetical stimuli was more accurately identified when presented in the participants' left visual fields. These findings suggested the left hemisphere functioned to identify verbal-conceptual forms, while the right hemisphere served to register nonverbal stimuli. Put simply, these findings suggested both hemispheres are involved in the processing and remembering of visually presented stimuli, but that the hemispheres cull different kinds of information from the same stimuli. More recently, Evans and Federmeier (2007) utilized ERP methodology to examine the time course of hemispheric asymmetries during a verbal memory task. In their task, Evans and Federmeier presented participants with 567 nouns, each with a length of 4-6 letters that were selected for their frequency of use in the English language. These words were randomly presented in a serial fashion on either the right or left side of a computer screen, and a random selection of these words were repeated during the task at random intervals. The participants were asked to (a) fix their gaze on a cross in the center of the screen while the words were presented, then (b) respond "yes" if the word being presented had been displayed previously or "no" if it was the first presentation of the word. Evans and Federmeier found that stimuli processed in the right hemisphere (i.e., presented in the left visual field) were more accurately identified during the task overall, but that P2 component potentials (an index of implicit memory processing) were greater in left hemisphere. This suggested the left hemisphere processed visually presented verbal stimuli with more abstract processes, while the right hemisphere is involved in more veridical processing.

Religion and Differential Neural Processing

Moll et al. (2005) called for an examination of how culturally shaped values and preferences may influence social interactions. Religion is one such cultural input (Baumsteiger, Chenneville, & McGuire, 2014). Moreover, religion has been associated with differential neural processing (Inzlicht, McGregor, Hirsh, & Nash, 2009). For example, Inzlicht and colleagues found evidence suggesting religion may produce an emotionally palliative effect. These authors utilized EEG and compared ERP data of participants with varying levels of religious zeal as they completed the Stroop color-naming task (MacLeod, 1991), a task designed to be mentally difficult. These authors utilized an eight-item measure of religious zeal (McGregor, Haji, Nahs, & Teper, 2008; $\alpha = .75$), defined as a fervent and even fanatical form of belief marked by intolerance of dissent. It was found that higher levels of religious zeal were related to lower error-related neural responses. Further, source localization of this ERP data coincided with the N2 cognitive conflict detection literature, as these findings were a product of differential activation of the anterior cingulate cortex (ACC).

Having established religion's association with differential neural processing, a basis is provided to search for other possible ways that religion may affect neural processing. Given the inconsistent findings in the literature relating morality and religion (Baumsteiger, Chenneville, & McGuire, 2014), neuroscience techniques, specifically ERP examination, may be well-suited to provide another layer of insight, as they provide objective, high-temporal-resolution accounts of neural processing.

Purpose and Importance of the Study

The present study examined how the brain processes social interactions entailing a moral violation, social conventional violation, or no violation, and the role of religion in

influencing neural response when providing judgments of these interactions. Specifically, I examined the effect of religious commitment and the type of dilemma (conventional or moral) on the amount of neural resources needed to make a judgment about the dilemma. Understanding this relationship is a crucial initial step toward understanding the processes involved in the zone of mediation where we—and our clients—make meaning of our experience.

Religion and Morality

Religion and morality reflect an individual's deepest held attitudes and beliefs, and both may tap into and inform personal beliefs about right and wrong. However, there is disagreement on whether religion relates to morality at all. A recent Pew poll found that a majority of individuals believe morality cannot exist without religion (Pew Research Center, 2007). This notion was espoused by William James (1902) when he stated clearly that an authentic religious life should be judged by its moral helpfulness. Baggini (2003), however, contended morality exists independent of religion, stating that in as far as morality emerges from empathy, a sense of caring, and anger at injustices in the world rather than fear of punishment, religious individuals and atheists uphold the same moral values.

This inconsistency also emerges within the moral psychology literature. Kohlberg (1967) claimed morality and religion were discrete domains independent of one another. Speaking to this point, Walker (2003) stated religious considerations, even if they did contribute to moral reasoning, were omitted across much of moral psychology because religion tended to be conceptualized as a domain independent from morality. Walker then cited several qualitative case studies of identified moral exemplars, the bulk of whom

attributed their consistent morally virtuous behavior to values derived from their religious faith.

The inconsistency emerges in the empirical literature as well. In an investigation of the decision styles of religious individuals using self-report measures of religiosity and motivated social cognition, Duriez (2003, 2004) found that religious people are more likely than non-religious people to embrace traditions, order, and structure; espouse culturally conservative, authoritarian beliefs; and ascribe importance to the expectations of authority figures when making crucial life decisions. Other research suggested a more direct relationship between religious experience and morally relevant behavior. For example, when participants were implicitly primed with religious representations (e.g., words like "God") they score higher on measures of generosity in economic games and were less likely to cheat as opposed to neutrally primed participants (Randolph-Seng & Nielsen, 2007). Banerjee, Heubner, and Hauser (2010) provided further evidence of a direct relationship between religion and moral reasoning, as they sampled 8778 participants across four factors (gender, education, politics, and religion) and analyzed their responses to moral dilemmas in unfamiliar situations. These authors found that people who identified as religious gave more deontological/rule-based judgments than atheists. In other words, participants who were less religious tended to judge the actions or inactions described in the moral dilemmas as more permissible. It should be noted; however, Banerjee, Heubner, and Hauser cautioned against embracing this direct relationship because, although it was statistically significant, the effect size was extremely low.

Research investigating perceptions of religious and nonreligious individuals is also inconsistent. Wright and Nichols (2014) demonstrated a tendency for individuals to conflate religion with morality when appraising the actions of others. Participants in this study appraised morally laden behavior of both atheists and Christians. Despite identical actions committed by both atheists and Christians, participants consistently ascribed more positive appraisals to Christians and more negative appraisals to atheists. Further, participants also deemed moral behavior to be more consistent with Christians and immoral behavior to be more consistent with atheists. Gervais (2014) investigated perceptions of good deeds that were performed as a result of either religious motivations or as an end itself. Counter to Wright and Nichols, Gervais found that across six studies (n =1,078), participants (identifying as both religious and nonreligious) viewed good deeds as less moral when they were performed out of religious motivations. Interestingly, this tendency was found even when the religiously motivated deed was identical to a deed performed without religious motivation.

Other research describes a more complex relationship with moral reasoning. Baumsteiger, Chenneville, and McGuire (2014) sampled 1037 college students who completed measures of religiosity, spirituality, and the ethics position questionnaire (EPQ; Forsyth, 1980), a scale tapping into two facets of moral reasoning (idealism and relativism). It was found that moral idealism related positively to religiosity, however, religiosity accounted for very little of the variance in moral reasoning. Taken together, this suggested religious individuals may be more idealistic in that they are likely to believe the best outcomes across all situations can be achieved without any harming anyone.

The research relating morality and religion has long been inconsistent, especially research examining a direct relationship between the constructs of religion and morality (McKay & Whitehouse, 2015). McKay and Whitehouse posited the issue underlying the inconsistency in the literature pertains to overarching conceptual differences in the constructs of religion and morality from competing theoretical camps. McKay and Whitehouse also proposed the inconsistencies in the literature can be avoided by fractionating the constructs of religion and morality into coherent biological and psychological components.

Indeed, associations have long been found between components underlying the constructs of religion and morality. Batson et al. (1989) found that cognitive components of moral reasoning related to religiosity, as it was found that individuals who question their own faith but feel compelled to find religious certainty tend to use the higher reasoning levels in the Kohlberg (1981) model than religious individuals. Similarly, Wahrman (1981) found that adherence to religious dogma related negatively with increased levels of moral judgment on the defining issues test (Rest, 1979), another widely used measure of moral reasoning development.

Batson (1976) differentiated between three types of religious orientations (means, ends, & quest) that may elucidate some of the differences in how religion relates to morality. A means orientation represents a utilitarian, self-serving attitude which one uses to provide self-justification as well as serving as a symbol for their way of life, an ends orientation represents a religious attitude in which one's faith is the primary value and primary motivator for living, and the quest orientation represents someone who continues to seek answers to questions regarding the meaning of life. Sapp and Gladding (1989)

utilized the Batson distinction to examine how these orientations might relate to one's moral reasoning. Sapp and Gladding found a significant negative relationship between the ends orientation and levels of moral judgment, which contravened their hypothesis that it would be positive and countered the previously held assumption that a life devoted to one's faith would relate to one's level of morality. This finding suggested the relationship between religion and morality might have more to do with conformity and adherence to orthodoxy rather than concerns of upholding fairness and preventing harm. However, while this study does lend validation to the Batson tripartite religious orientation model, moral reasoning is conceptualized in a purely rational sense and without any influence of the criticisms of the rationalist moral reasoning models that would arise in the years following publication. Moreover, the rationalistic models of moral reasoning may even preclude deeply religious people from attaining the highest level of reasoning because their highest moral pursuits may not center on justice and fairness (Haidt, 2012; Haidt & Graham, 2007).

More recent research also has found associations between components of religion and morality (cf. Shariff, Piazza, & Kramer, 2014). Shariff and colleagues summarized the meta-analytic literature examining similarities and differences between theists and nontheists and found that, overall, theists and nontheists differed in meta-ethical beliefs and cognitive styles. Importantly, these authors stated these differences drive differences in how morality is construed. For instance, these authors stated those who believe in a deity are distinguished from nontheists in that they not only consider their deity to be the source of justice, but the author of morality itself. Further, they stated differences emerge when examining how theists and nontheists approach resolving moral issues.

Specifically, Shariff and colleagues stated theists tended toward moral objectivism, where only one person could be correct in a moral disagreement, whereas nontheists find morality to be culturally relative and more subjective.

Religious commitment and religious schemas. Across the literature, it appears a relationship is found between religion and moral reasoning when religion becomes ingrained into one's experience, such that it shapes and colors perceptions and cognitions. Worthington (1988) put forth a model to address the variation in the ability of one's religious experience to account for differences in levels of mental health. This model may also tap into ingrained religious experience, as it is predicated on the notion that the more religiously committed a person is, the more that person would evaluate their world on religious dimensions according to their religious values. The key component of the Worthington model is *religious commitment,* which is defined as "the degree to which a person adheres to his or her religious values, beliefs, and practices and uses them in daily living" (Worthington et al., 2003; p. 85). Further this model contends the differences between highly religiously committed individuals compared to non-religious individuals—or even moderately religious people—lies in how highly religious individuals use more religious cognitive constructs or religious schemas. Studies supporting this theory include Lupfer, Brock, and DePaola (1992), who found that 183 participants varying in their commitment to conservative Christianity tended to make more religious-heavy attributions to observed behavior when more committed to his or her religion. Another study supporting the increased use of religious schema found that the belief systems of 1,475 Protestant and Catholic were most differentiated along schematic/aschematic dimensions when identified as highly religious (Lau, 1989).

Hardy et al. (2012) found moral identity mediated the relationship between moral behavior and religious commitment in adolescents. Adolescent participants (n = 502) ranging in age from 10- to -18 years of age provided answers to measures assessing degrees of religious commitment, religious involvement, empathy, and aggression. Structural equation modeling revealed religious commitment indirectly related to aggression (in a negative direction) and empathy (in a positive direction), with moral identity serving to mediate these relationships. This finding suggests morality is influenced by religiosity when one's morality is more central to their sense of identity.

The construct of religious commitment has been construed, operationalized, and measured in many ways over the last 60 years, including belief in religious creeds, level of engagement in religious activities, attitudes and importance of religious experience, and membership status in religious organizations (Hill & Hood, 1999). Perhaps the earliest formal study of this construct was Glock (1962), who eventually developed a five-dimensional model of religious commitment (Glock & Stark, 1966). Glock and Stark's religious commitment dimensions are (a) ideological (beliefs), (b) intellectual (knowledge), (c) ritualistic (overt behavior traditionally defined as religious), (d) experiential (experience defined as religious in the sense of fomenting emotions or feelings), and (e) consequential (the effects produced by the other four dimensions when applied in the secular world). Though foundational in setting the stage for stage for examining notions of religious commitment, drawbacks of this model include (a) it was developed with only Judaic and Christian religious traditions in mind, and (b) it centers predominantly on how individuals adhere to traditional doctrines (Worthington et al., 2003). While Worthington and colleagues' operationalization of religious commitment

shares many similarities with previous conceptualizations (e.g., examination of intrinsic religious motivation), it expands the definition to include the employ of religiously themed perceptions or readily available schema to filter incoming sensory information from the world.

Summary

Overall, the body of research examining the relationship between religion and morality is inconsistent. The research that does indicate a direct relationship is tenuous, and other research describes a relationship that is complex at best or indirect. Further, It should be noted that the research to date comparing religion and morality relies almost entirely on self-report measures, which are fraught with threats to validity (e.g., social desirability bias, response bias; Heppner, Wampold, & Kivlighan, 2008) and are incapable of detecting the influences of moral functioning that occur outside of conscious awareness. For example, neural areas implicated for valence appraisals and affective processing have been found to activate rapidly following morally laden stimuli (i.e., within 100ms post stimulus; Yoder & Decety, 2014). Moreover, many discriminatory attitudes operate at unconscious levels (Greenwald, McGhee, & Schwartz, 1988), but nevertheless may be involved in moral functioning. For example, Moll et al. (2005) stated the PFC areas implicated in SECs are fundamental in forming discriminatory attitudes and beliefs. Using neuroscience techniques like EEG to examine ERPs are a way to circumvent the subjectivity inherent to self report measures while providing the ability to examine the neural mechanics of moral functioning that occurs rapidly and outside of conscious awareness (Yoder & Decety, 2014).

Coupling the inconsistent findings in the research relating religion and morality with the reliance within the research on self-report measures (which may be problematic), an objective measure, such as a biophysiological marker, may prove indispensable in elucidating the intricately complex relationship between religion and morality. To the best of this researchers knowledge, there are no studies examining how religion or religious commitment might be related to differences in neural processing during moral reasoning tasks. As stated previously, one article was found which investigated the association of religion and neural processing (Inzlicht, McGregor, Hirsh & Nash, 2009). These authors examined ERP data and found that those scoring higher on measures of religious zeal may experience lower levels of error-related negativity when committing a conspicuous error. However, no research was found examining how one's religious commitment might produce differential neural processing during judgments of moral or social conventional dilemmas. Considering (a) the contemplation of these sorts of situations are tantamount to experiencing the world and making meaning of it (Hayes, 1994), (b) navigating a social world requires several of these judgments be made every day (Moll et al., 2005), and (c) cultural inputs, like religion, may shape and color how moral and social conventional considerations are processed and construed into meaning (Moll et al., 2005), this research is warranted. If indeed a difference in N2 amplitude exists, it would suggest a difference in automatic processing across groups. It would also suggest activation of perceptual functional features as described in Moll et al. (2005). This sort of objective investigation may be what is necessary to more fully elucidate the nature of the relationship between moral reasoning and religious commitment. Moreover, as will be explained in the next section, this elucidation will be a necessary first step in

untangling some the complex intricacies of how individuals take information from the world and ultimately make meaning of it.

ERP may be uniquely suited to illuminate differences in moral reasoning because of its objective nature, and because of its ability to examine attention capture and level of effort or attentional resources allocated to specific regions of the brain. Moreover, it allows for examination of these spatiotemporal neurodynamic properties with high time resolution. If, however, no significant results are found, it would provide objective evidence to bolster the findings in the literature suggesting little to no relationship exists between religion and morality (Baumsteiger, Chennevile, & McGuire, 2014). Further, no significant results found would suggest what Banerjee, Heubner, and Hauser (2010) describe as "a distinctively moral faculty that operates independently of the deliberative and emotional mechanisms that play a central role in much of our more reflective and evaluative lives" (p. 276).

Implications for counseling psychology. As counseling psychologists, understanding how our clients think and reason is tantamount to understanding our clients as meaning makers. Kohlberg (1967) stated the cognitive processes involved in thinking and reasoning are, in essence, a relating of events where knowledge and information from the world are put together. Importantly, this reasoning encompasses the complete range of situations requiring thinking, judgment, and reasoning, from everyday mundane decisions to the more difficult dilemmas that may result in inevitable harm to oneself or to another. Kegen (1982) elaborated this point, stating that in order to understand our clients, reasoning must be viewed as an active relating and experiencing of the world rather than merely what the client knows: "to understand a client is to enter into that

region between an event and a reaction to it—the place where it actually becomes an event for that person" (Kegen, p. 2). Hayes (1994) augmented this point, stating that when reasoning occurs, it is in fact our clients experiencing, understanding, and making meaning of the world. Hayes stated, "it is in this zone of mediation that counselors help clients to make better meaning of their experience" (p. 262). Indeed, clients will face countless judgments in their everyday experience (Moll et al., 2005), including salient reasoning and judgment situations in the counseling room, such as examining personal motives, deciding what one should or would do, and contemplating hypothesized outcomes of acts that may affect others (Hayes, 1994). However, as was described in previous sections, moral functioning entails more components than reasoning alone, and examining the relationship between religion and moral considerations remains difficult when relying on self-report methodology alone. If counseling psychologists are to truly understand clients as meaning makers, it will require a direct study of the brain during moral functioning, as moral functioning is tantamount to clients interacting with information from the world and making meaning of it. By examining the role of religious commitment and type of dilemma presented to participants, I hope to answer the call to action put forth by Gonçalves and Perrone-Mcgovern (2014) and to provide a foundational understating of the neural mechanisms underlying reasoning. Understanding this relationship will be a crucial initial step toward understanding the processes involved in the zone of mediation where we—and our clients—make meaning of our experience.

Definition of Important Terms

Moral Domain. The moral domain is structured by notions that center on fairness, reciprocity, and prevention of harm (Turiel, 1983, 2008). Moral violations entail

a disruption or a failure to behave or make choices that are consistent with these notions of fairness and prevention of harm. Turiel also defined moral considerations as being immutable and unbound across cultures and societal norms.

Social Conventional Domain. The social conventional domain is structured by the conception of rules that are culturally dependent, change across social groups, and serve to facilitate social coordination (Turiel, 1983, 2008). Turiel also stated social conventional considerations differ from moral considerations in that these notions may be altered to align with changing social consensus or to align with a respected authority.

Event-Feature-Emotional Complexes (EFECs). EFECs are the product that emerges from the interaction of the brain areas involved in human moral functioning (Moll et al., 2005). The brain areas involved in EFECs are associated with event knowledge, social perceptual and functional information, and affective influence, and these interact to produce a complex that binds moral coloring to the human conscious experience (Moll et al., 2005).

Religious Commitment. Religious commitment was defined as the degree to which individuals use their matrix of religious beliefs in their everyday experience (Worthington, 2003). Worthington stated the assumption underlying the concept of religious commitment is that those scoring high in religious commitment evaluate the world through religious schemas, thus integrating their religion into much of their daily lives.

Appendix B – Informed Consent for Participants

Study Title: How the Brain Responds to Reasoning Tasks

Study Purpose and Rationale

The purpose of this research project is to examine patterns of brain activity during reasoning tasks, specifically the relationship between religious commitment on reasoning tasks describing moral and social conventional violations.

Inclusion/Exclusion Criteria

To be eligible to participate in this study, you must be at least 18 years old and be enrolled in a CPSY undergraduate course.

Participation Procedures and Duration

For this project, you will be asked to complete a series of questionnaires assessing demographic information and factors that may influence neurological activity (e.g. history of concussion, medications, history of anxiety). You will also be asked to complete a questionnaire assessing your level of religious commitment. You will then be prepared for an electroencephalograph (EEG) recording session and your brain activity will be measured while completing several computerized tasks. For the EEG recording you will be asked to wear a tight cloth cap and electrodes will be secured to the cap and to several locations on the face using a non-toxic gel. The computerized tasks you will be asked to complete involve reading a series of scenarios and making decisions by providing ok/not ok. While you perform the computerized tasks, your neural activity will be recorded in the next room and your progress will be monitored using a video camera. The video feed is passive and will not be recorded. The experiment should take approximately 1 ½ to 2 hours to complete.

Data Confidentiality or Anonymity

Data collected during this study will remain confidential and no identifying information such as names will appear in any publication or presentation of the data.

Storage of Data

Informed consent documents and survey responses will be stored in the faculty advisor's research lab. Data collected via computer will be entered into a software program and stored on the researcher's password-protected computer. Collected data will kept for an indefinite amount of time for the purpose of future research analyses. Only members of the research team will have access to the data.

Risks or Discomforts

There are no anticipated risks associated with participating in the current study. However, it is possible you may feel some discomfort while being prepared for the EEG recording. Gel will be placed in holes in the cap and will get into your hair. The gel is non-toxic and washes out easily with a shower. You may quit the study at any point you feel uncomfortable or do not wish to continue.

Who to Contact Should You Experience Any Negative Effects from Participating in this Study

Should you experience any feelings of anxiety, there are counseling services available to you through the Ball State University Counseling Center in Muncie, 765-285-1736.

Benefits
Participants will receive credit in CPSY undergraduate course for participating in fulfillment of partial course requirements. Participants will receive research credits equal to the time spent in the study (e.g. 1 credit for 1 hour, 2 credits for 2 hours).

Voluntary Participation
Your participation in this study is completely voluntary and you are free to withdraw your permission at anytime for any reason without penalty or prejudice from the investigator. Please feel free to ask any questions of the investigator before signing this form and at any time during the study.

IRB Contact Information
For one's rights as a research subject, you may contact the following: For questions about your rights as a research subject, please contact the Director, Office of Research Integrity, Ball State University, Muncie, IN 47306, (765) 285-5070 or at irb@bsu.edu.

Study Title How the Brain Responds to Reasoning Tasks

****

Consent
I, _____, agree to participate in this research project entitled, "Religious Commitment and its Relationship to Reasoning on Moral and Conventional Tasks." I have had the study explained to me and my questions have been answered to my satisfaction. I have read the description of this project and give my consent to participate. I understand that I will receive a copy of this informed consent form to keep for future reference.

To the best of my knowledge, I meet the inclusion/exclusion criteria for participation (described on the previous page) in this study.

_____ _____

Participant's Signature Date

Researcher Contact Information

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Appendix C – Recruitment Email

Email Subject Line: Participants Needed for Brain Study

Hello,

I am seeking participants for a study on to examine patterns of brain activity during reasoning tasks.
This study will be held in North Quad 069 and will take approximately 1-1/2 to 2 hours of your time.

In this study, you will complete a questionnaire and participate in a behavioral reasoning task via computer. EEG procedures will be used to examine brain activity. EEG works by recording the electrical activity of a person's brain. The EEG process involves a cap with electrodes being placed on your head after which you will perform the computerized task while brain activity is recorded. Gel will be placed in holes in the cap and will get into your hair. The gel is non-toxic and washes out easily with a shower. **Participants must be willing to have gel placed in their hair for the EEG section of the study.**

Qualifications for participation: In order to participate in this study you must be at least 18 years of age at the time of the study and enrolled as a student at Ball State University. If you're interested in participating, please e-mail Aaron at amesche@bsu.edu to set up an appointment.

Thanks so much!

Aaron Esche, MS
Doctoral Student
Kristin Perrone-McGovern, PhD
Faculty Advisor
Counseling Psychology and Guidance Services
Ball State University
Muncie, IN 47306

Appendix D – Response to Scheduled Participants

Hello,
You have scheduled an appointment to participate in a research study about brain activity and performance on behavioral tasks. Thank you for your interest and willingness to participate!
The study will take place in NQ069 at the following time:
(Date/Time)
A few things you need to know before your session:

- Please come to the session with **DRY** hair.
    - Wet hair will make you ineligible for participating in the EEG section of the experiment and you will be asked kindly to reschedule your appointment.
- Make sure you qualify for the study!
    - You are:
        - 18 years or older
        - A student at Ball State University
- Please arrive on time. If you are unable to make your scheduled appointment, please e-mail me ASAP at amesche@bsu.edu to reschedule your appointment for a more convenient time.

If you have any questions or concerns please feel free to email me at amesche@bsu.edu.

I greatly appreciate your time and participation!

Appendix E – Demographic Questionnaire

Health and Demographics Questionnaire

participant code:_____

The following set of questions is to screen for factors known to affect sensory information processing. Please be as honest as possible.

1. What is your date of birth? _____

2. In the blank provided, please indicate your gender _____

3. My religious view is:
   a. Atheist
   b. Agnostic
   c. Buddhist
   b. Hindu
   c. Jewish
   d. Muslim
   e. Protestant Christian
   f. Roman Catholic
   g. Other_____

4. What is your ethnicity?
   a. American Indian or Alaska Native
   b. Asian
   c. Black or African American
   d. Native Hawaiian or Other Pacific Islander
   e. White
   f. Hispanic/Latino/Latina
   g. Other

5. Have you ever hit your head and experienced a concussion?
   a. Yes
   b. No

6. If yes, please explain and include the date and number of concussions experienced:_____

7. Since birth have you ever had any other medical problems
   a. Yes
   b. No

8. If yes, please explain: _____

9. Since birth have you ever been hospitalized?
   a. Yes
   b. No

10. If yes, please explain:_____

11. Do you use tobacco (smoke and/or chew)?
   a. Yes
   b. No

12. If yes, please explain:_____

13. Have you had any hearing problems?
   a. Yes
   b. No

14. If yes, please explain:_____

15. Are you on any medications?
   a. Yes
   b. No

16. If yes, please list them all including birth control:
_____

17. Do you have now or have you ever had any of the following? Select yes or no.

Diabetes	Yes	No
Neurological disorder	Yes	No
Brain disorder	Yes	No
Vascular disorder	Yes	No
Stroke	Yes	No
Learning deficiency or disorder	Yes	No
Reading deficiency or disorder	Yes	No
Attention-deficit disorder	Yes	No
Hyperactivity	Yes	No

18. If you checked yes for any of the items in the previous question, please describe your diagnosis briefly:
_____

Appendix F – Debriefing for Participants

Thank you for your participation in this study. The purpose of this study is took look at how people with different levels of religious commitment might process morally laden information differently. Now that we have your brain activity recorded, we are going to look at how specific brain areas were activated while you were asked to judge whether certain scenarios were "Ok" or "Not Ok."

It is our hope to be able to use this information to better understand how individuals take information from the world, reason with it, and ultimately make meaning of it.

Thank you very much for your time and for your participation in this study. It is very much appreciated!

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Appendix G – The Religious Commitment Inventory-10

The Religious Commitment Inventory-10 (RCI-10)

Instructions: Read each of the following statements. Using the scale to the right, CIRCLE the response that best describes how true each statement is for you.

Not at all true of me 1	**Somewhat** true of me 2	**Moderately** true of me 3	**Mostly** true of me 4	**Totally** true of me 5

1. I often read books and magazines about my faith.	1 2 3 4 5
2. I make financial contributions to my religious organization.	1 2 3 4 5
3. I spend time trying to grow in understanding of my faith.	1 2 3 4 5
4. Religion is especially important to me because it answers many questions about the meaning of life.	1 2 3 4 5
5. My religious beliefs lie behind my whole approach to life.	1 2 3 4 5
6. I enjoy spending time with others of my religious affiliation.	1 2 3 4 5
7. Religious beliefs influence all my dealings in life.	1 2 3 4 5
8. It is important to me to spend periods of time in private religious thought and reflection.	1 2 3 4 5
9. I enjoy working in the activities of my religious organization.	1 2 3 4 5
10. I keep well informed about my local religious group and have some influence in its decisions.	1 2 3 4 5

Appendix H – Scenarios and Endings (Lahat, Helwig, & Zelazo; 2013)

Scenario	Ending		
	Moral	Conventional	Neutral
Sarah had dinner at a restaurant with her friend, Anna. They ordered spaghetti with meatballs, which they wanted to share. The waiter brought them their meal and told them that there were no more forks and spoons left. Sarah decided to use her hands in order to…	Ruin It	Consume It	Return It
In Sharon's school students should address their teachers by their title or last name, but not by their first name. Sharon saw her teacher, Dr. Jason Smith, in the hallway and said: "Hello…	Butthead	Jason	Doctor
Josh played a basketball game in the school playground with some of his friends. Suddenly, he started to…	Insult	Undress	Dribble
Jennifer was very bored during class. She wanted to be somewhere else. When her teacher asked her a question she decided to…	Hit	Leave	Speak
George was a very short boy. He wanted to be a few inches taller. He found his mother's high heels and decided to…	Smash them	Wear them	Shine them
In Alex's house, there is a rule that toys and books have to be put back in their place after using them. Alex finished reading a book he found on the bookcase and placed it on the floor. Instead of returning it to its place he decided to…	Rip it	Leave it	Read it
Nathan wanted to contribute to the class discussion. He looked at his friend, Dan, who was sitting beside him and suddenly he started…	Kicking	Yelling	Smiling
In Tom's school students are not allowed to enter or open the door of a class that already started. Tom overslept, and when he arrived at the school the teacher had already began teaching. He stood in front of the classroom door. He looked at the door-knob and decided to…	Break it	Turn it	Clean it
David and Ben were in the library studying for an important test on the next day. They realized it was late, and they were running out of time. While they were still in the library and had a couple of more hours to study they decided to…	Cheat	Shout	Try
Alice woke up and went to her closet to choose what she would wear to school that day. She saw the pajamas she borrowed from her sister and decided that when she goes to school that day she would…	Shred them	Wear them	Fold them
In Jennifer's school chewing gum during class is not allowed. Her classmate, Ted, offered her a pack of gum. While the teacher was speaking during class, Jennifer looked at the gum and decided to…	Steal it	Chew it	Save it
Sara was in the library and she was whispering to her friend, Jessica. When she whispered she was…	Hurtful	Noisy	Quiet
Ted sat at the dinner table with his family. Suddenly he started…	Fighting	Burping	Grinning
Michael woke up and started getting ready for school. He decided to go over to his sister's closet. He saw a dress and he…	Tore it	Wore it	Left it